Master-2 internship: Analysis of data from the Time Projection Chambers of the T2K Near Detector

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Neutrino group of LPNHE laboratory

- Group leader: Jacques Dumarchez.
- My internship supervisor: Boris Popov.
- Other members: Claudio Giganti, Simon Bienstock, Jean-Michel Levy, Bernard Andrieu, Scotto Lavina Luca.

Goals of the internship

• My internship is centered around the TPCs (time projection chambers) of the ND280 near detector.
• In the first part of the internship, I will learn about the structural design, working principle, and the factors that are affecting the performance of the TPCs and their associated uncertainties.
• In the second part, I will learn how the data of the TPCs when combined with the data of another components of near detector can assist the oscillation analysis.
• Finally, I will get used to ND280 software and take part in controlling the quality of the data taken by the near detector and resolve some discrepancies between the results of Monte Carlo simulation and the data.

Current Task

• Make the plots from the ROOT files of the Run7 data of the ND280 near detector. For example: plots of pull distributions of the particles passing through the TPCs, plot of measured energy loss versus the measured momenta.

Example 1

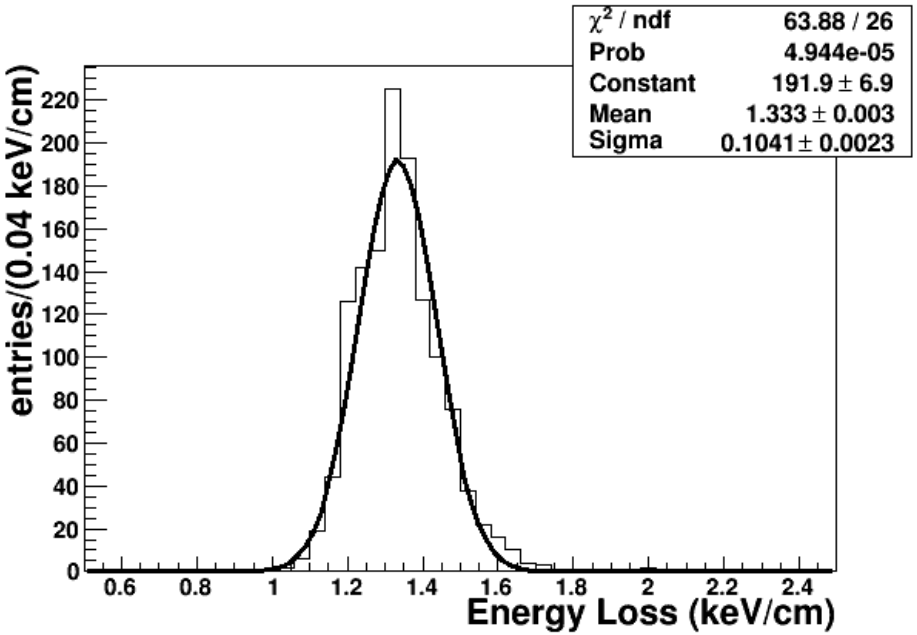

Figure: Distribution of the energy loss for negatively charged particles with momenta between 400 and 500 MeV/c. Source: [1].

Example 2

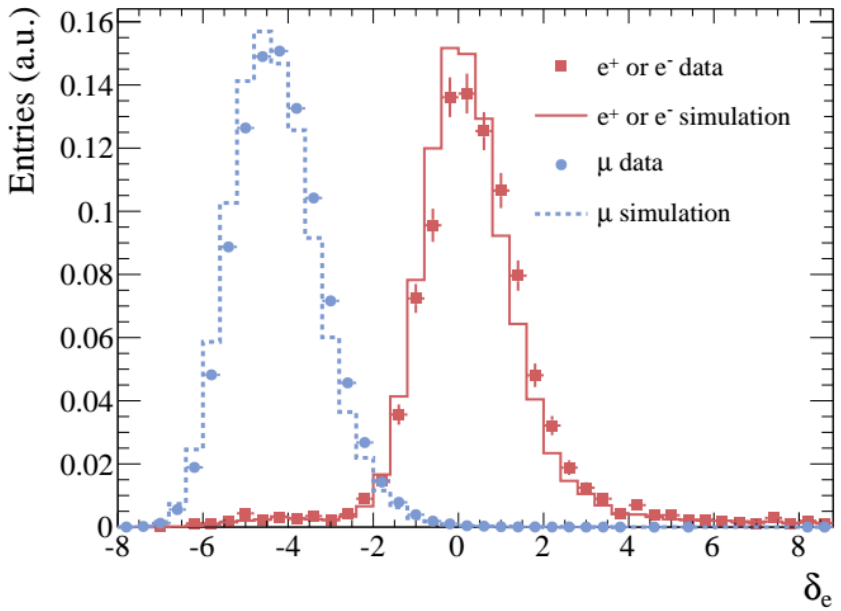

Figure: Pull distributions in the electron hypothesis ($\delta_E(e)$) of electrons or positrons and of muons in data (points) and in simulation (lines). Because the muon is put in the wrong hypothesis, its pull distribution is not a Gaussian centered at 0 with width 1. Source: [2].

Example 3

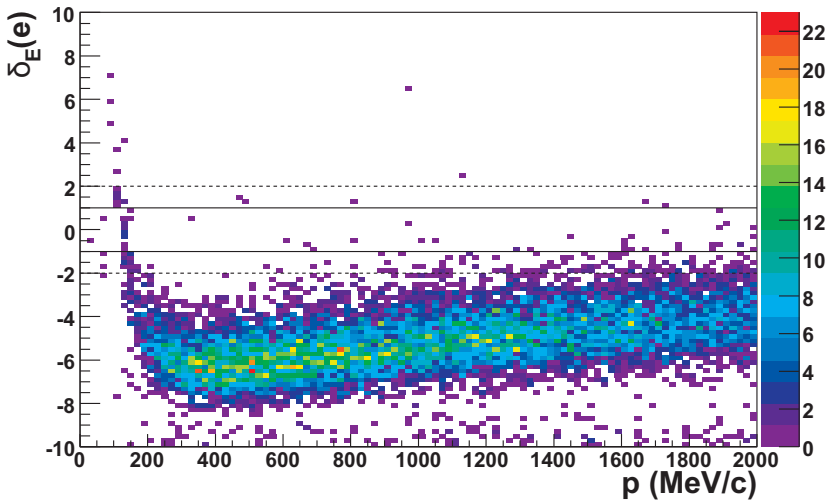

Figure: Distribution of the energy loss pull in the electron hypothesis for a sample of through going muons. The solid and dashed lines indicate $|\delta_E(e)| < 1$ and $|\delta_E(e)| < 2$ respectively. Source: [1].

Example 4

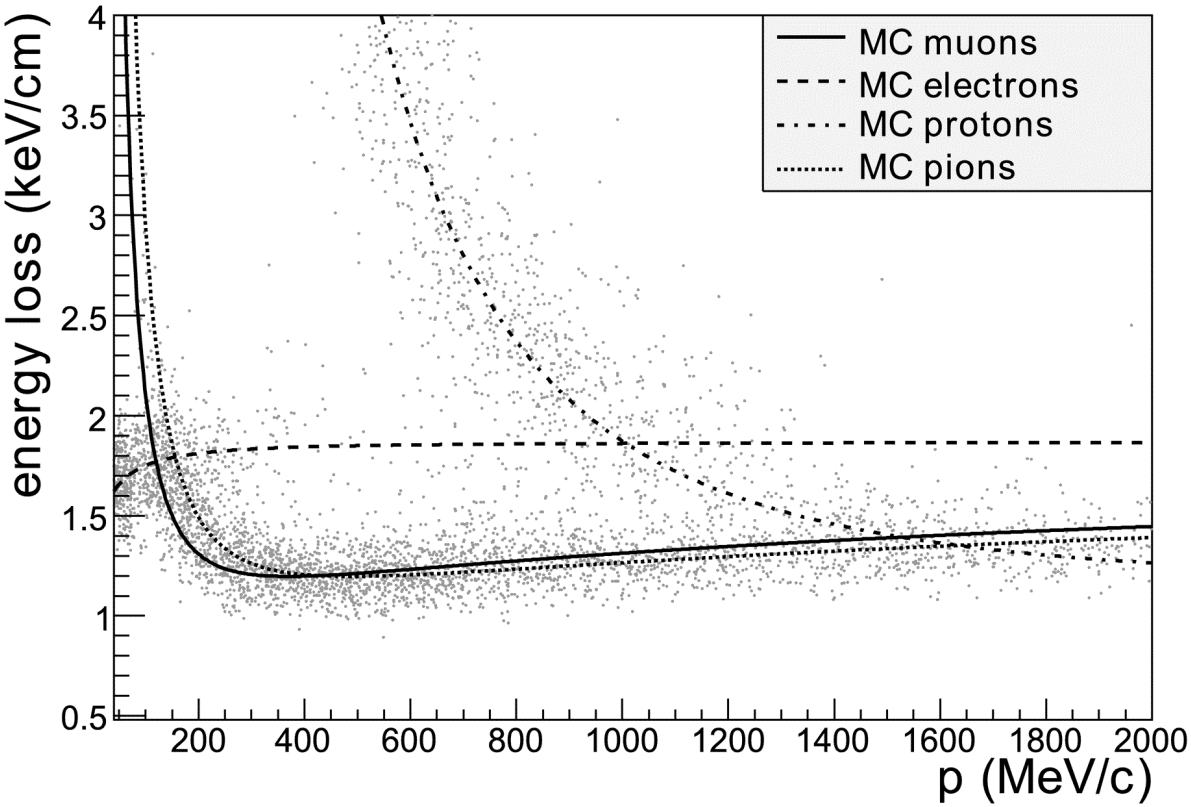

Figure: Each scatter point is the measured energy loss C_T, the curves are the expected energy loss $C_E(j)$. If a scatter point is near a curve, then it is identified as the particle associated to that curve. Source: [3].

Current Task

- Identify the particles in the TPCs from the derived pull distributions.

Next Task

- Run Monte Carlo simulation and compare the simulation result with the TPCs' data.

References

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