

A critical appraisal of the LSND anomaly

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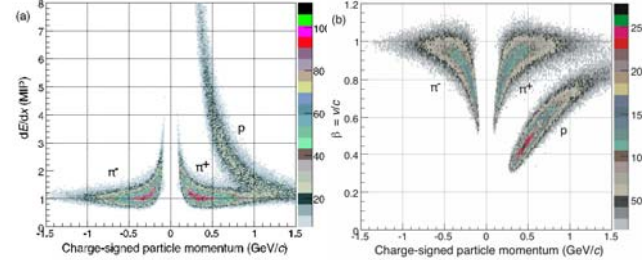
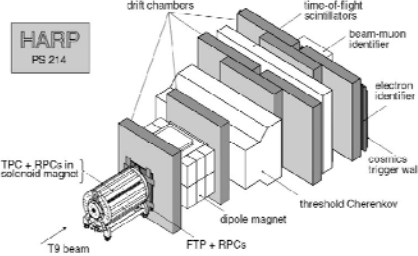
Introduction

Precise spectra of secondary hadrons from the interaction of protons and pions with nuclei are, inter alia, of importance for understanding the cause of the "LSND anomaly".

The HARP experiment at the CERN PS took data in 2001 and 2002 with proton beams of 1.5 GeV/c momentum impinging on a H₂O target. The detector comprised a forward spectrometer and a large-angle spectrometer. This poster is exclusively concerned with data from the HARP large-angle spectrometer.

The latter consists of a cylindrical TPC that measures p_T and the polar angle θ of tracks, and their specific ionization dE/dx . Timing RPCs that surround the TPC measure time of flight with a view to complementing and corroborating particle identification.

Detector characteristics & performance



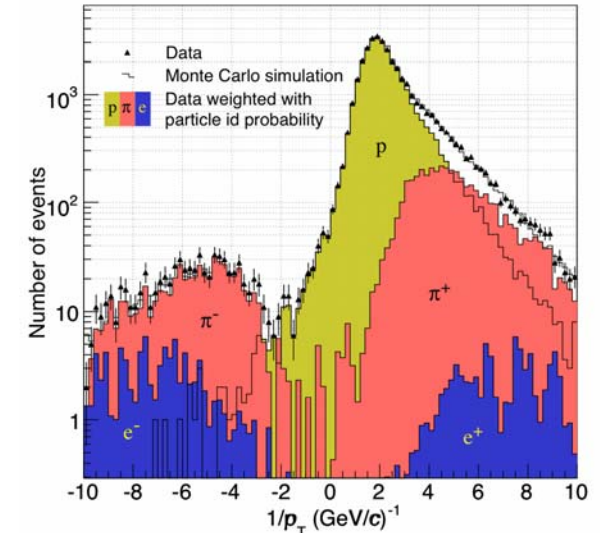
TPC

- $\sigma(1/p_T) \approx 0.20 \text{ (GeV/c)}^{-1}$
- $\sigma(dE/dx)/(dE/dx) \approx 0.16$

RPCs

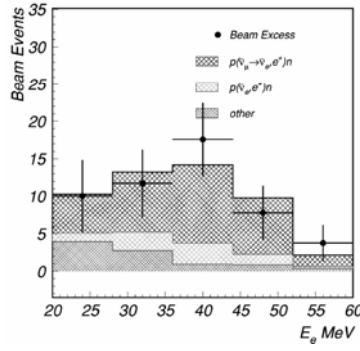
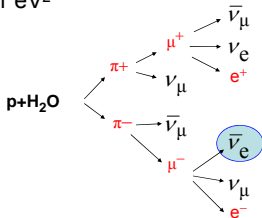
- $\sigma(\text{TOF}) \approx 175 \text{ ps}$

The most important quality is the proton/pion separation



The LSND anomaly

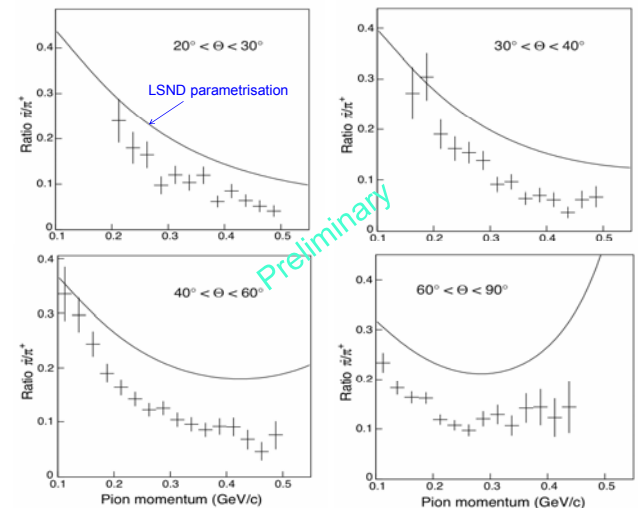
Anomalous 3.8σ excess of $\bar{\nu}_e$, interpreted as $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$ oscillations with $\Delta m^2 \approx 1 \text{ eV}^2$



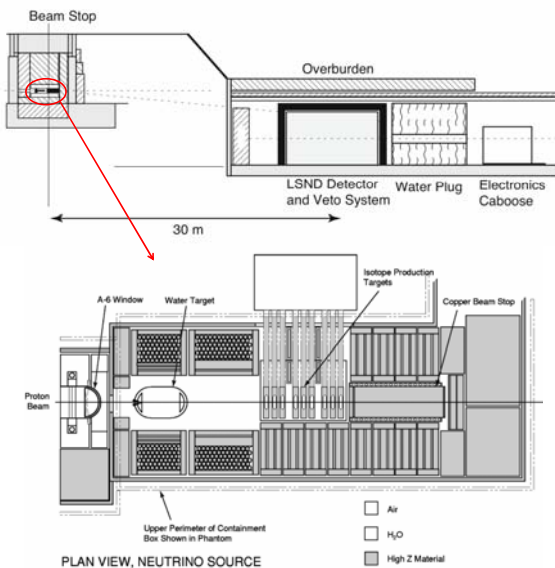
HARP-CDP vs LSND

One explanation of the LSND anomaly is an underestimate of the π^- production assumed in the LSND analysis; see below for their parametrization.

We have measured the π^-/π^+ ratio on a 60 cm long H₂O target for the same momentum of the incoming protons.



LSND Detector



LSND detector setup

Details of LSND target station

References

[1] V. Ammosov et al., NIM A588 (2008) 294 and NIM A578 (2007) 119

Conclusion: The measured π^-/π^+ ratio is smaller than the π^-/π^+ ratio utilized in the LSND analysis.