Comparison of Electron and Neutrino Scattering Properties under GENIE Neutrino Event Generator's Models

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5 min 5 slides

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Neutrino Cross-section Measurements with Electron Scattering Data Constrain

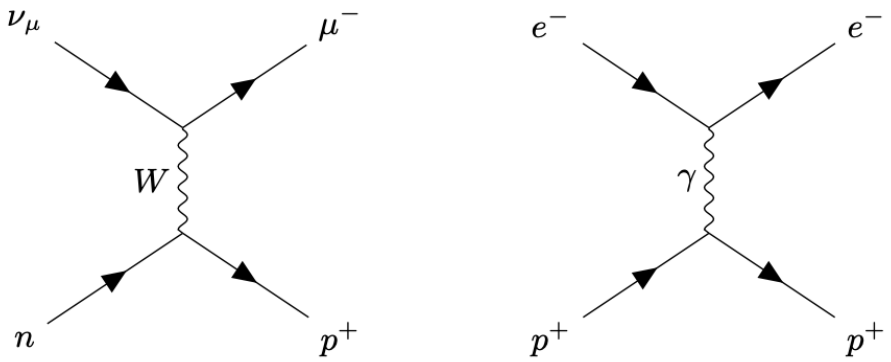
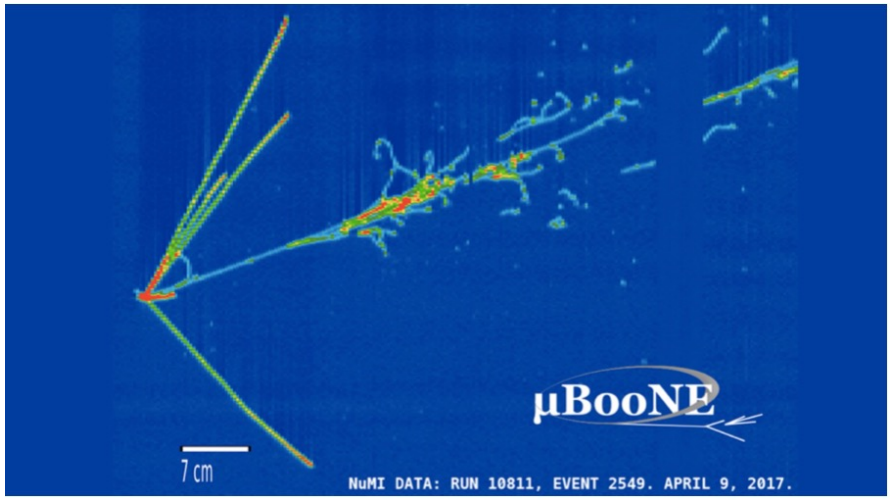


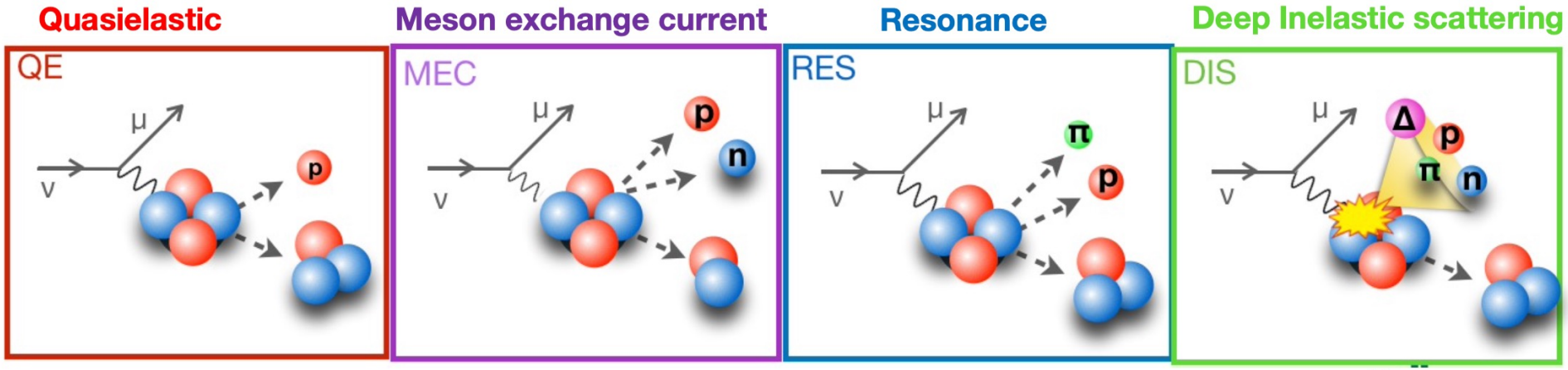
FIG. 1. The Feynman diagram for an idealized CCQE(Quasi-elastic scattering on nucleons) scattering event for a muon neutrino (left) and electron (right).

- Accurate neutrino cross-section measurements and modeling of nuclear effects are required for precise measurements of neutrino oscillation physics.
- However, interaction uncertainty will limit future oscillation experiment.
- Since neutrino beams are hard to form and measure, we propose using electrons to verify these models.
  - e & ν interact similarly
  - Many nuclear effects are identical
  - e beam energy is known, can test energy reconstruction.

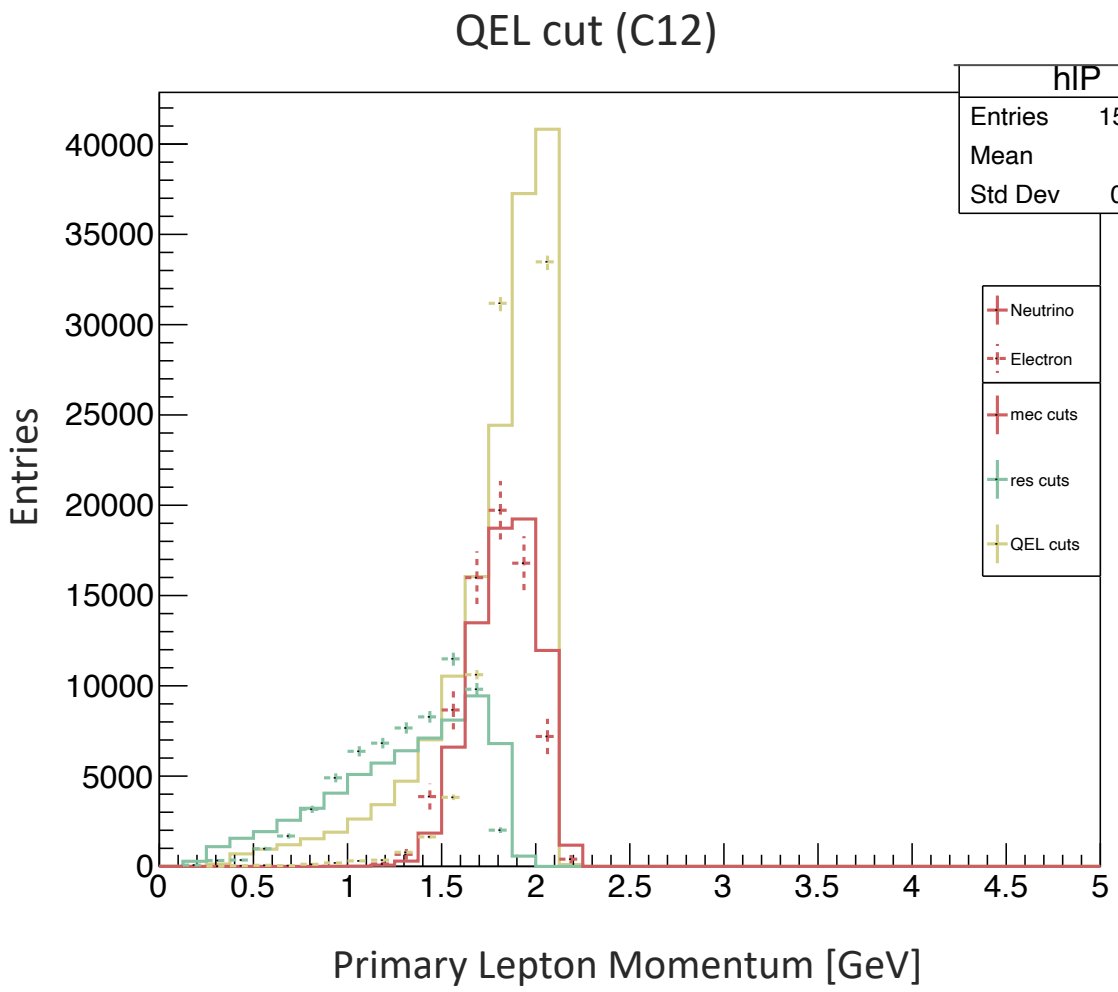
Neutrino-proton scattering is complicated



- We tried to make cuts to separate the inelastic scattering using The GENIE Neutrino Monte Carlo Generator.
- We will be able to compare the electron model and neutrino model of the inelastic scattering and find sequence and shared characteristics.



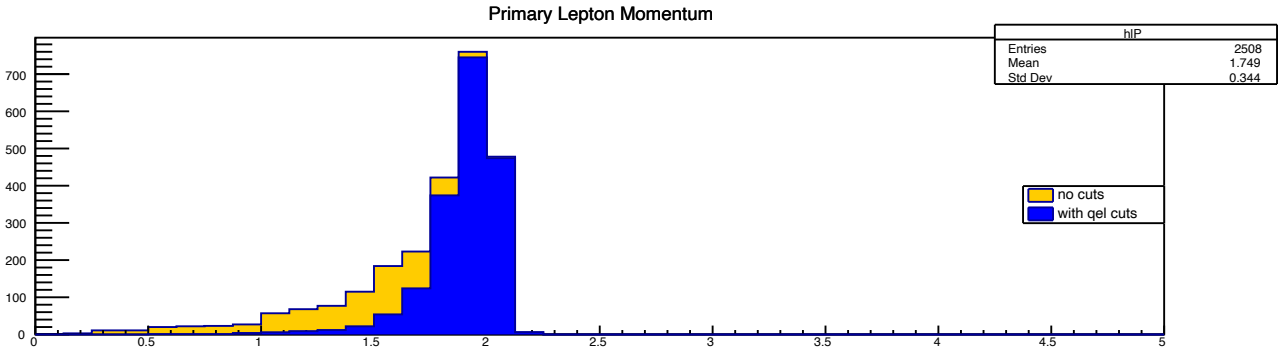
Methodology- Electron and Neutrino Scattering Channels Comparisons of Carbon12



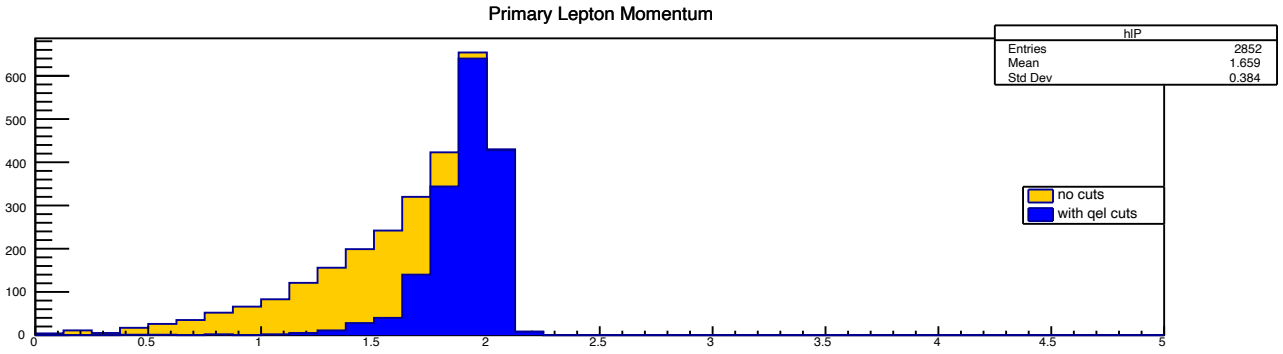
- ROOT is very flexible and provides both a programming interface to use in own applications and a graphical user interface for interactive data analysis.
- By remodifying the code, we are able to generate histograms of different properties of the electron and neutrino scattering.
  - Primary Lepton Momentum
  - Proton Momentum
  - Proton Angle
  - Primary Proton Transverse Momentum
  - …….

Neutrino scattering interacting with different target material protons

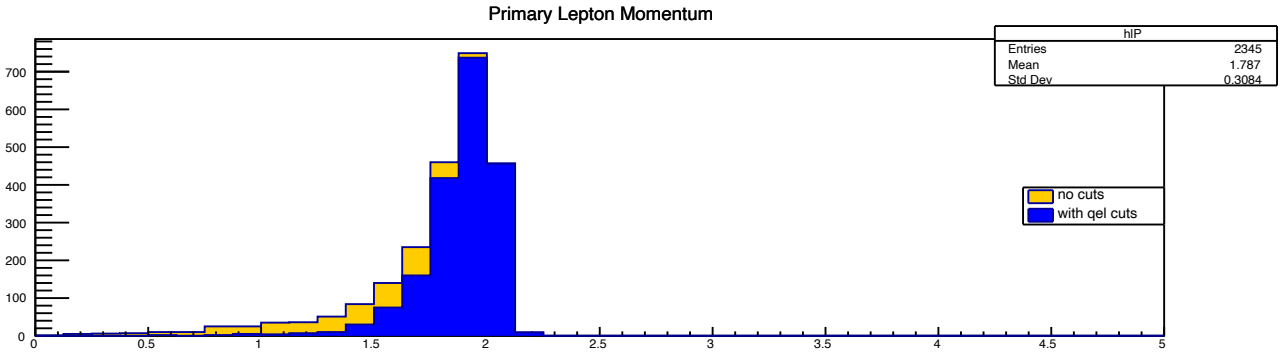
C12



Fe56



He4



Thank you for listening!