MiniBooNE and SciBooNE experiments, summary

Booster Neutrino Beamline

- Booster is an old, unusual synchrotron.
- 19ns separated 81 bunches make 1.6μs spill.
- In normal operation, fast extraction brings 5E12 ppp with 5 Hz.
- difference of 2 toroid measurement provide 2% systematic error on POT counting.
- Surface current of magnetic focussing horn give 4-8% normalization+shape error.
- Due to lower energy, BNB is believed to have small secondary scatterings.
- HARP measurement provide pion distribution input for beamline simulation. More importantly, it directly provides errors of that. This dramatically reduces errors from meson production (Error from Sanford-Wang fit~16%, direct error from HARP~8%). This error mostly affects normalization of measured cross section.

MiniBooNE detector

- MiniBooNE run is over, proposal for extension is discussed.
- MiniBooNE is mineral oil based Cherenkov detector. Cherenkov based measurement is affect by small detector error (light propagation model).
- MiniBooNE can be a scintillation detector. In this way, MiniBooNE can measure total deposit energy, for example, NCEL analysis is done in this way, by measuring scintillation light from N protons. But light propagation affects large errors, especially above Cherenkov threshold.
- All MiniBooNE cross section are defined from final state particle. In this way, MiniBooNE cross sections don't have intra-nuclear effect errors. However, some measurement, especially pion production measurements, are affect by nuclear effect in the detector, such that pion absorption in the oil.

MiniBooNE and SciBooNE experiments, summary

SciBooNE detector

- SciBooNE is a tracker, consist of 3 part, scintillation x-y tracker active target vertex detector “SciBar”, electro-magnetic calorimeter “electron catcher”, and muon range detector “MRD”.
- SciBar provide beautiful tracks, the analysis to deal multiple samples classified by topologies (1 track, 2 track, μ+p, μ+π, etc) is very complicated and in situ tuning of interaction models is unavoidable (unfortunately).
- The energy deposit around the vertex, called “vertex activity”, is the new tool to study nuclear break-up, and SciBooNE used this to find coherent CC1π^+ production and coherent NC1π^o production.