Recent MicroBooNE cross-section results: neutrino-induced baryon production
Richard Diurba (University of Bern) for the MicroBooNE Collaboration

**Introduction to MicroBooNE**
- LArTPC with 85 tonne of LAr.
- Three wire planes detect ionized electron signals.

**MicroBooNE Event Generator Tune**
- Base sim. is GENIE v3.0.6 G18_10a_02_11a
- Tune to 2016 T2K ND280 CC0pi data with pars. on: 
  - $M_A$, CCQE, CC2p2h norm., CCQE random phase approximation strength, and 2p2h lepton kinematics.

**Progress at Lambda Production Cross Section**
- Uses Fermilab’s NuMI beam to measure muon antineutrinos scattering to a final state with a muon and a lambda.
- Sensitivity studies developed a PDF for this Cabibbo suppressed interaction.

**CC1p Measurement of Transverse Kinematic Imbalance**
- Analyzes transverse momentum ($\delta p_t$) and angle ($\delta \alpha_t$) imbalances between outgoing CCQE($1\mu 1p$) muon and proton.
- 1st double-differential transverse kinematic imbalance meas. on any target
- Use log-likelihood of hit $dE/dx$ fitter to find 1 proton track and 1 muon track: 
  - $J_{High\ Energ.\ Phys.\ 2021,\ 153\ (2021)}$

**CC2p2h**
- Measurement of 2 proton final states with implications for nuclear physics modeling as most events predicted are CC2p2h.
- Extracted as a function of proton opening angle and center angle relative to the outgoing muon.
- Selection uses $dE/dx$ log-likelihood algorithm to find one muon and two protons: 
  - $J_{High\ Energ.\ Phys.\ 2021,\ 153\ (2021)}$

**Conclusion**
- MicroBooNE has an expansive set of analyses probing final state and nuclear modeling through interactions involving final state baryons.
- Results can inform event generator models for the future of MicroBooNE, the Short Baseline Neutrino program, and DUNE.