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Hadronization processes in neutrino interactions for oscillation physics

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Next generation neutrino oscillation experiments utilize details of hadronic final states to improve the precision of neutrino interaction measurements. The hadronic system was often neglected or poorly modelled in the past, but they have significant effects on high precision neutrino oscillation and cross-section measurements.
Among the physics of hadronic systems in neutrino interactions, the hadronization model controls multiplicities and kinematics of final state hadrons from the primary interaction vertex.
For relatively high invariant mass events, many neutrino experiments rely on the PYTHIA program.
Here, we show a possible improvement of this process in neutrino event generators, by utilizing expertise from the HERMES experiment.
Finally, we estimate the impact on the systematics of hadronization models for neutrino mass hierarchy analysis using atmospheric neutrinos such as the PINGU experiment.

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