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Jet Hadronization via Recombination of Parton Showers in Vacuum and in Medium

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We have developed a hadronization model for jet parton showers based on the quark recombination model. Gluons at the end of a perturbative shower evolution undergo a non-perturbative splitting into quark and antiquark pairs, then a Monte-Carlo version of instantaneous quark recombination is applied. Finally remnant quarks (those which have not found a recombination partner) are connected by color strings and subjected to Lund string fragmentation. When applied to parton showers from the PYTHIA Monte Carlo generator, the final hadron spectra from our calculation compare quite well to PYTHIA jets that have been hadronized with the default Lund string fragmentation. This hadronization model readily generalizes to jet showers emerging from a quark gluon plasma by allowing recombination of shower partons with thermal partons, sampled from fluid dynamics or blast wave models. We find that the recombination of shower and thermal partons leads to a significant enhancement of intermediate transverse momentum pions and protons at both RHIC and LHC. Our results thus suggest that medium modification of jet fragmentation provides a plausible explanation for the enhanced production of intermediate transverse momentum hadrons and the changed hadron chemistry observed in experiments. A computer code based on this vacuum and medium hadronization model has been developed within the JET collaboration and can be combined with existing jet shower Monte Carlo codes.

On behalf of collaboration:

JET

Primary author: FRIES, Rainer (Texas A&M University)

Co-authors: Prof. KO, Che-Ming (Texas A&M University); HAN, Kyongchol (Texas A&M University)

Presenter: FRIES, Rainer (Texas A&M University)

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