

Measurements of Hard-Scattering by PHENIX at RHIC.

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Hard-scattering in p-p collisions was discovered at the CERN-ISR in 1972 by the observation of an unexpectedly large yield of particles with large transverse momentum (p_T), with a power-law tail which varied systematically with the c.m. energy (\sqrt{s}) of the collision. This proved that the partons of Deeply Inelastic Scattering strongly interacted with each other. Measurements of inclusive single or pairs of hadrons were used to establish that high transverse momentum particles in p-p collisions are produced from states with two roughly back-to-back jets which are the result of scattering of constituents of the nucleons as described by Quantum Chromodynamics (QCD), which was developed during the course of those measurements. These techniques have been used extensively and further developed at RHIC since they are the only practical method to study hard-scattering and jet phenomena in A+A central collisions due to the large multiplicity, roughly A times that of p-p collisions. One of the major, arguably *the* major, discovery at RHIC was the observation by PHENIX of “jet quenching” via the suppression of π^0 and non-identified charged hadrons in Au+Au collisions at mid-rapidity for large transverse momenta, $p_T > 2$ GeV/c, due to an interaction of the outgoing partons with the medium produced. This opened up the possibility of using hard-scattering to probe the properties of the medium. PHENIX measurements will be reviewed both as fundamental probes of QCD and as probes of the medium. For instance, one of the recent observations in p-p collisions—which overturned an idea dating from the seminal work of Feynman, Field and Fox in the 1970’s—is that the p_{T_a} spectrum of away-side particles triggered by a π^0 with p_{T_t} , corrected for the trigger-jet fragmentation, does not measure the fragmentation function of the away-jet, although the away-jet fragmentation function is measured for direct-photon and jet triggers.