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Magnetic Reconnection-Powered Relativistic Particle Acceleration, High-Energy Gamma-Ray Emission, and Pair Production in Coronae of Accreting Black Holes[1] DMITRI UZDENSKY, CIPS, University of Colorado Boulder — Magnetic reconnection is a fundamental plasma process believed to play an important role in energetics of magnetically-dominated coronae of various astrophysical objects including accreting black holes. Building up on recent advances in kinetic simulations of relativistic collisionless reconnection, we investigate nonthermal particle acceleration and its key observational consequences for these systems. We argue that reconnection can efficiently accelerate coronal electrons (as well as ions) up to hundreds of MeV or even GeV energies. In brightest systems, radiation back-reaction due to inverse-Compton (and/or synchrotron) emission becomes important at these energies and limits any further electron acceleration, thereby turning reconnection layers into powerful and efficient radiators of γ-rays. We then evaluate the rate of absorption of the resulting γ-ray photons by the ambient soft (X-ray) photon fields and show that it can be a significant source of pair production, with important implications for the composition of black-hole coronae and jets. Finally, we assess the prospects of laboratory studies of magnetic reconnection in the physical regimes relevant to black-hole accretion flows using modern and future laser-plasma facilities.

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