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Effect of the "minimal" viscosity on observables at RHIC[1] DENES MOLNAR, Purdue University / RIKEN-BNL Research Center, PASI HUOVINEN, University of Virginia — The goal of heavy ion experiments at the Relativistic Heavy Ion Collider (RHIC) is to create and study a novel hot and dense phase of quark-gluon matter, the so-called quark gluon plasma (QGP). Several features of the RHIC data can be reproduced using ideal hydrodynamics, which lead to the suggestion that the plasma could be a "perfect fluid." However, ideal hydrodynamics assumes zero viscosity (and therefore no dissipation), contrary to general expectations based on quantum mechanics that imply finite rates and, therefore, a nonzero "minimal viscosity." These expectations have been verified for strongly-coupled $\mathcal{N} = 4$ supersymmetric Yang-Mills theories, for which the lower bound on the shear viscosity to entropy density ratio is $\eta/s = 1/(4\pi)$. Parton kinetic theory calculations based on microscopic $2 \to 2$ rates do indicate that short, but non-zero, effective mean free paths generate sizable dissipative effects for conditions expected at RHIC. We show that these results imply that even a small η/s ratio ~ 0.1 affects observables at RHIC and leads to significant deviations from ideal hydrodynamic behavior.

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