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Hall Viscosity II: Extracting Viscosity from Conductivity MOSHE GOLDSTEIN, BARRY BRADLYN, NICHOLAS READ, Yale University — When time reversal symmetry is broken, the viscosity tensor of a fluid can have non-dissipative components, similarly to the non-dissipative off-diagonal Hall conductivity. This "Hall viscosity" was recently shown to be half the particle density times the orbital angular momentum per particle. Its observation can thus help elucidate the nature of the more exotic quantum Hall states and related systems (e.g., p+ip superconductors). However, no concrete measurement scheme has hitherto been proposed. Motivated by this question we use linear response theory to derive a general relation between the viscosity tensor and the wave-vector dependent conductivity tensor for a Galilean-invariant quantum fluid. This relation enables one to extract the Hall viscosity, as well as other viscosity coefficients (shear and bulk) when relevant, from electromagnetic response measurements. We also discuss the connection between this result and a similar one recently derived by C. Hoyos and D. T. Son [arXiv:1109.2651].

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