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Quantum corrections to the longitudinal and anomalous Hall conductivity in (Ga,Mn)As.[1] PARTHA MITRA, NITESH KUMAR, NITIN SAMARTH, Dept. of Physics, Penn State University, University Park PA 16802 — Although the canonical ferromagnetic semiconductor (Ga,Mn)As has now been studied extensively for over a decade, the fundamental understanding of the temperature-dependent conductivity and the origins of the anomalous Hall effect still remain open questions. Here, we report measurements of the longitudinal and transverse conductivity in (Ga,Mn)As samples in the regime of "dirty" diffusive transport ($1 \leq k_F l_e \leq 3$ as calculated from the Drude formula) over a wide temperature range (50 mK $\leq T \leq$ 5 K). Although we observe a power law temperature dependence of the conductivity, the scaling is inconsistent with standard expectations based upon known quantum corrections to the conductivity. We also examine the scaling of the anomalous Hall conductivity with longitudinal conductivity and compare our observations with theories of the anomalous Hall effect.

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