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Low frequency 1/f and random telegraph noise in (Ga,Mn)As[1]
MENG ZHU, XIA LI, GANG XIANG, NITIN SAMARTH, Dept. of Physics, Penn State University, University Park PA 16802 — Resistance noise measurements can provide insights into the interplay between charge transport and magnetism in complex physical systems [B. Raquet *et al.*, Phys. Rev. Lett. **84**, 4485 (2000)]. We report the temperature- and magnetic field-dependence of the low frequency electrical noise in (Ga,Mn)As epilayers with different Mn concentrations (and different conductivity). Surprisingly, we do not observe any anomalies in the noise spectra across the Curie temperature. However, we find an enhancement in the integrated noise (over the frequency span 125mHz-11Hz) at temperatures below ~ 10 K where the resistivity shows a minimum. For more metallic samples, the normalized power spectrum density is $1/f$-like over the entire temperature range studied, while more insulating samples show Lorentzian spectra accompanied by random telegraph noise (RTN) at low temperatures. The magnetic field dependence of the integrated noise shows distinct correlations with magnetization switching, suggesting changes in scattering during domain wall nucleation/propagation. From the magnetic field driven suppression of the RTN, we infer the existence of nanoscale magnetic clusters that fluctuate between two states separated by a field-tunable barrier.

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Nitin Samarth
Dept. of Physics, The Pennsylvania State University

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