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Challenging the spin accumulation interpretation of local "3T" measurements[1] HOLLY TINKEY, IAN APPELBAUM, PENGKE LI, University of Maryland- College Park — The recent observation of magnetoresistance in local "three-terminal" (3T) measurements on ferromagnet/ insulator/ semiconductor junctions have spawned many claims of direct bulk spin injection or "accumulation". We present a self-consistent model to rigorously calculate expected voltage changes due to electrochemical potential splitting from spin accumulation driven by pure elastic tunnel injection in such junctions, and find that the experimentally observed magnetoresistance vastly exceeds theoretical predictions in all doping, temperature, and bias voltage regimes. Our own experimental measurements using inelastic electron tunneling spectroscopy reveal that extrinsic impurities and defects within the junctions are responsible for the observed magnetoresistance signals, which cannot possibly be attributed to spin dephasing of polarized bulk electrons from elastic injection as claimed by proponents of the method.

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