Abstract Submitted
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Current-induced spin polarization in InGaAs and GaAs epilayers as a function of doping density MARTA LUENGO-KOVAC, SIMON HUANG, DAVIDE DEL GAUDIO, JORDAN OCCENA, RACHEL GOLDMAN, VANESSA SIH, Univ of Michigan - Ann Arbor — Current induced spin polarization (CISP) is a phenomenon in which an applied electric field produces a bulk spin polarization. We performed crystal-axis dependent measurements of CISP and spin-orbit (SO) splitting in seven Si-doped $In_xGa_{1-x}As$ samples with different Indium concentrations and doping densities. In all samples, we found a negative differential relationship between the magnitude of the CISP and SO splitting. Since this is contrary to what is predicted by the Rashba-Edelstein equation, which includes only intrinsic SO contributions, we conclude that extrinsic polarization mechanisms dominate. This is corroborated by temperature-dependent spin dephasing time measurements, which show that the contribution from the extrinsic Elliot-Yafet dephasing mechanism is comparable to or greater than the contribution from the intrinsic Dyakonov-Perel dephasing mechanism. It is also consistent with measurements performed on GaAs, in which we measured CISP despite the samples having no measurable SO fields. We also found that samples with larger doping densities and Indium concentrations had greater CISP, consistent with our expectations.

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