Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Spin-orbit coupling and spin relaxation in phosphorene MARCIN KURPAS, MARTIN GMITRA, JAROSLAV FABIAN, Physics Department, University of Regensburg, 93040 Regensburg, Germany — We employ first principles density functional theory calculations to study intrinsic and extrinsic spin-orbit coupling in monolayer phosphorene. We also extract the spin-mixing amplitudes of the Bloch wave functions to give realistic estimates of the Elliott-Yafet spin relaxation rate. The most remarkable result is the striking anisotropy in both spin-orbit coupling and spin relaxation rates, which could be tested experimentally in spin injection experiments. We also identify spin hot spots in the electronic structure of phosphorene at accidental bands anticrossings. We compare the Elliott-Yafet with Dyakonov-Perel spin relaxation times, obtained from extrinsic couplings in an applied electric field. We also compare the results in phosphorene with those of black phosphorous. This work is supported by the DFG SPP 1538, SFB 689, and by the EU Seventh Framework Programme under Grant Agreement No. 604391 Graphene Flagship.

Marcin Kurpas
Physics Department, University of Regensburg, 93040 Regensburg, Germany

Date submitted: 30 Nov 2015 Electronic form version 1.4