Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Faraday Rotation in Single Layer Semiconductors with Anisotropic Carrier Effective Mass JOHN CAVIN, Washington Univ, LI YANG COLLABORATION — Faraday rotation is a magneto-optical effect wherein the polarization of light is rotated upon transmission through some medium. Media where this effect is known to occur include plasmas, semiconductors, and some organic material. Typically, the angle of rotation is proportional to the distance the light travels through the medium. For this reason, it was a surprise when giant Faraday rotation was discovered in quintessentially thin graphene half a decade ago. Whereas symmetry clearly causes carriers in graphene to have isotropic effective masses, our research explored the nature of Faraday rotation in a single-layer materials with anisotropic carrier effective mass. One possible example of such a material would be black phosphorus. We reevaluated and rederived the Drude model expression of Faraday rotation in the framework of general effective mass. The result was non-trivial polarization-dependence: different rotation angles for different initial polarization states. Additionally, the Faraday rotation matrix is not norm-conserving, indicating energy exchange between carriers and the optical field. We believe these properties could prove useful in sensors, polarization rotators, and polarization measurement devices.

John Cavin
Washington Univ

Date submitted: 11 Nov 2016 Electronic form version 1.4