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Spin Hall Magnetoresistance in a Canted Ferrimagnetic Insulator

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The interplay of charge and spin currents at the interface between ferrimagnetic insulators and paramagnetic metals gives rise to novel spintronic effects, such as the recently discovered spin-Hall magnetoresistance (SMR). The effect was described as a result of interfacial spin mixing, i.e., of a spin-angular-momentum exchange between the magnetization in the ferrimagnet Y3Fe5O12 and the spin polarization of the conduction electrons in paramagnetic Pt [1].

We study this effect in ferrimagnet/normal metal bilayers, comparing the response in the collinear and canted magnetic phases of Gd3Fe5O12. In the collinear magnetic phase, where the sublattice magnetic moments are all aligned along the same axis, we observe the conventional SMR. In the canted phase, however, the SMR changes sign [2]. Using element-selective X-ray absorption and X-ray magnetic circular dichroism experiments, we understand these observations in terms of the magnetic field and temperature dependent reorientation of magnetic moments on the different magnetic sublattices of Gd3Fe5O12 [2]. This enables a magnetotransport-based investigation of non-collinear magnetic textures.

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[2] K. Ganzhorn et al., Phys. Rev. B **94**, 094401 (2016).

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