Title: Electro and thermal magnetotransport in antiferromagnetic systems

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Abstract: *How to electrically identify the Néel vector reversal in $\mathcal{PT}$ symmetric systems?* The detection of magnetic order reversal has been one open problem in antiferromagnetic spintronics. More so, in systems like the tetragonal CuMnAs which preserve the combined $\mathcal{PT}$ symmetry, since the combined $\mathcal{PT}$ symmetry renders odd magnetoresistance effects such as the anomalous Hall effect to be zero. This thesis focuses on trying to provide an answer to the question above. We present the measurement of second-order magnetotransport effects as a mechanism to identify the reversal of the Néel order. We show it in two different systems, firstly on an out-of-plane synthetic antiferromagnet and later in the tetragonal CuMnAs. We also introduce a scanning thermal gradient microscopy which allows us to exploit different thermoelectric effects depending on the symmetries of the chosen material. For instance, in the collinear CuMnAs we take advantage of the magneto-Seebeck effect to image changes in the magnetic structure due to the application of electrical current pulses. In the case of the noncollinear antiferromagnetic Mn_3Sn, the anomalous Nernst response is used to map the magnetic order.

Keywords: Antiferromagnetic spintronics, $\mathcal{PT}$ symmetric systems, Second-order magnetotransport effects, Scanning thermal gradient microscopy