

## Ultra-sensitive measurement of magnetisation dependent chemical potential in ferromagnetic materials

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We quantify the chemical potential anisotropy in ferromagnetic materials. Aluminium single electron transistors (SETs) are lithographically fabricated on top of a planar gallium manganese arsenide substrate which acts as an electrostatic gate. The conductance variation of the SET provides a direct probe of the magnetisation dependent change in the chemical potential. These experiments contrast with previous demonstrations of Coulomb blockade anisotropic magneto-resistance (CB-AMR)<sup>1 2</sup> since, in our case, the electron transport is decoupled from the magnetic element. Furthermore, since any ferromagnetic material can be used as the electrostatic gate we demonstrate a universal technique to determine the magnetic anisotropy of the chemical potential.

<sup>1</sup>J. Wunderlich, et al., Phys. Rev. Lett. **97**, 077201 (2006).

<sup>2</sup>A. Bernard-Mantel, et al., Nature Physics **5**, 920 (2009).