Spin transport in graphene and the role of ferromagnetic tunnel contacts

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Abstract

Spintronics is a vision of using the spin of the electrons instead of its charge to perform both information storage and processing in a single device[1]. Several schemes considering the spin of electrons have been proposed, for example Spin-Field Effect Transistor[2] and Spin Logic devices[3]. Performance of such spintronic devices depend on the spin relaxation time and spin diffusion length in the materials, defined by spin relaxation mechanisms. For instance the strong interest in graphene based spintronic devices stems from their long spin coherence lengths, because of the absence of hyperfine interactions and weak spin-orbit coupling[4]. However, the full potential of graphene spintronics has not been explored, and also much of the physics revealed are not yet understood [5,6].

We will present pure spin transport and precession measurements in Graphene devices at room temperature, with and without tunnel barriers. The aim is to understand the basic spin injection, transport and relaxation in Graphene, and the effect of ferromagnetic tunnel contacts. Graphene-tunnel barrier-ferromagnet nano devices with multiple contacts were prepared by standard electron beam lithography and lift off technique. The spin transport and spin precession measurements are performed in non-local spin-valve and Hanle geometries respectively. We will discuss in details the measured spin-signal and the spin life time on different devices.

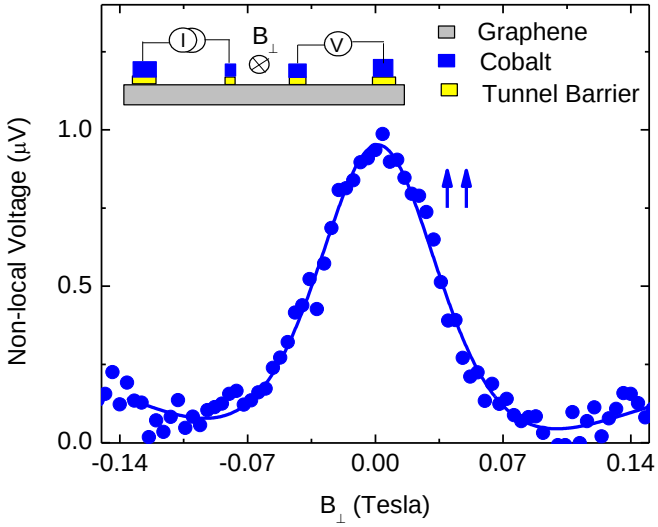

Figure 1. Non-local Hanle spin precession measurement in a graphene device at room temperature.

References

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