## *Toward ballistic spin transport in bilayer graphene*

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One of the goals in graphene-based spintronics is the realization of ballistic spin transport devices. There are three fundamental requirements to achieve this goal: 1. High charge carrier mobilities to allow for long mean free paths, 2. efficient electrical spin injection and detection, and 3. electric gate control over the spin direction. We demonstrate that the combination of bilayer graphene with the transition metal dichalcogenide $WSe_2$ is promising to fulfill these prerequisites. We show that bilayer graphene allows for long spin lifetimes combined with high charge carrier mobilities. The latter remain when bilayer graphene gets proximity-coupled to $WSe_2$ while the out-of-plane vs. in-plane spin lifetimes become highly anisotropic which is needed for spin manipulation. We also discuss first ballistic spin transport through gate-defined quantum point contacts in bilayer graphene. These devices also allow probing the spin-orbit gap in bilayer graphene, which is gate-tunable. The control over the spin-orbit gap is a very promising pathway for spin manipulation in lateral field-effect spin transistor architectures as well as ballistic spin valves and filters.