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Revisiting the measurement of the spin relaxation time in graphene-based spintronic devices HIROSHI IDZUCHI, CEMS, RIKEN, Japan, ALBERT FERT, Unité Mixte de Physique CNRS/Thales, France, YOSHICHIKA OTANI, ISSP, University of Tokyo, Japan — Spin transport in graphene has strongly drawn attention because of the expected long spin relaxation time τsf, but, τsf derived from experiments is rarely above 1 ns, shorter than theoretically expected and also largely dispersed [1]. Here we reanalyze Hanle curves in graphene-based lateral spin valves with various contacts by using the recently established model of Hanle effect taking into account the spin absorption by contacts [2]. We found the reanalysis of Hanle curves of four samples from transparent contacts to tunnel contacts, reported in ref.3, gives longer and much less dispersed τsf ranging around 500 ps compared to the original values ranging from 84 ps to 495 ps. Extending our analysis to typical recent experiments with long spin diffusion length, λ $\sim$10 μm, we find the spin absorption is even more pronounced because the contact resistance R needed to suppress the spin absorption scales with the spin resistance $\propto$ λ. Thus R in the range of 100 kOhm is generally not large enough to suppress the spin absorption, and taking into account the contacts is more important to characterize the real τsf in graphene with λ in this range.

[1] D. Pesin and A. H. MacDonald, Nmat 11, 409 (2012). [2] H. Idzuchi et al., PRB 89, 081308(R) (2014). [3] W. Han et al., PRL 105, 167202 (2010).

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