# Determination of intrinsic relaxation rates of miniaturized atomic magnetometer cells using optically detected magnetic resonance and the ground-state Hanle effect

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The intrinsic magnetic linewidth plays a determining part in the sensitivity an atomic magnetometer can achieve. It is governed by contributions of different relaxation processes that the spin polarization of the alkali atoms inside the vapour cell is subjected to. These intrinsic relaxation processes are due to collisions of the alkali atoms with the cell walls, with the buffer gas atoms and with each other. While all processes depend on temperature, the former two also depend on design of the vapour cell used.

An experimental study is presented where the intrinsic relaxation rates of miniaturized magnetometer cells fabricated by our group [1] are determined. The dependence of the intrinsic linewidth on temperature is investigated for cells of identical geometry with different buffer gas pressures. To that end two methods are used and compared: the optically detected magnetic resonance and measurements using the ground-state Hanle effect as comprehensively described recently for glass-blown vacuum cells [2]. To infer the cell-intrinsic parameters the measured data is extrapolated to vanishing pump laser and rf-field power. Both methods are compared directly without the necessity of modifications to the experimental setup. Advantages and disadvantages of the methods are discussed.

References:
[1] S. Woetzel *et al.*, Rev. Sci. Instrum. **82**, 033111 (2011).
[2] N. Castagna, and A. Weis, Phys. Rev. A **84**, 053421 (2011).