An unshielded atomic magnetometer

Giuseppe Bevilacqua[1], Valerio Biancalana[1], Yordanka Dancheva[2], Antonio Vigilante[2]
[1] DIISM, University of Siena - Italy
[2] DSFTA, University of Siena - Italy

Alkali vapour in sealed cells is the core of a setup developed for optical atomic magnetometry (OAM). Cs atoms are optically pumped with a circularly polarized laser radiation tuned to the D1 transition, and probed by a weak linearly polarized radiation tuned to the D2 transition. The evolution of the atomic state is inferred from the Faraday rotation of the probe beam polarization. We present some studies of the atom-light interaction (aimed at characterizing some phenomena occurring in the pumping process) and some magnetometric results, demonstrating the performance of the atomic sensor. The former deals with measurements and models devoted to characterize the interplay between Zeeman and Hyperfine optical pumping: the pump laser wavelength is broadly modulated at a frequency matching the Zeeman splitting, and the magnetic resonance (width and amplitude) is characterized as function of the detuning and the frequency excursion of the pump laser. The latter will focus on an experimental setup devoted to detect NMR signals from premagnetized samples. A pecularity of the described NMR-OAM apparatus is the detection in unshielded environment, where the magnetic disturbances are actively compensated by means of a self-optimized numeric control system.

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