

Tuning-Dressing exploitation in magnetometric measurements

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We have recently studied the effect of a weak oscillating field on a magnetically dressed precessing spin [1]. In the presence of a strong oscillating field (dressing field, DF) a secondary field (tuning field, TF), which oscillates at a harmonic of the DF frequency, concurs to modify the effective precession frequency around a (also weak) static field. After summarizing the phenomenology emerging from such tuning-dressing configuration, we will consider two possible applications in magnetometry. The first one consists in using an inhomogeneous TF in ultra-low-field MRI setups [2], to restore the magnetic resonance line-width [3], otherwise broadened by static field gradients. The second one is to detect (and possibly to image) samples of conductive materials through TF modifications caused by eddy currents.

[1] G. Bevilacqua, V. Biancalana, A. Vigilante, T. Zanon-Willette, and E. Arimondo; Harmonic fine tuning and triaxial spatial anisotropy of dressed atomic spins, *Phys.Rev.Lett.* **125**, 093203 (2020).

[2] G. Bevilacqua, V. Biancalana, Y. Dancheva, and A. Vigilante, Sub-millimetric ultra-low-field MRI detected in situ by a dressed atomic magnetometer, *Appl.Phys.Lett.*, **115**, 174102 (2019)

[3] G. Bevilacqua, V. Biancalana, Y. Dancheva, and A. Vigilante, Restoring narrow linewidth to a gradient-broadened magnetic resonance by inhomogeneous dressing; *Phys.Rev.Appl.* **11**, 024049 (2019)