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Faraday rotation echo spectroscopy of phase transitions[1]
SHAOWEN CHEN, RENBAO LIU, Department of Physics, The Chinese University of Hong Kong — Faraday rotation is widely used to study magnetic dynamics. We designed a scheme of Faraday rotation echo spectroscopy (FRES) that can be used to study spin noise dynamics in transparent materials by measuring the fluctuation of Faraday rotation angle. The FRES suppresses the static part of the noise and reveal the quantum fluctuations at relatively high temperature, which shares the same idea of the spin echo technique in nuclear magnetic resonance (NMR). We tested our theory on a rare-earth compound $LiHoF_4$. The quantum fluctuations obtained by FRES give an enhanced feature at the phase boundary. The FRES can be straightforwardly generalized to more complicated configurations that correspond to more complex dynamical decoupling sequences in NMR and electron spin resonance, which may give us more extensive information on the structural and dynamical properties of magnetic materials.

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