

Laser-polarimetric measurements of magnetic ac-susceptibility in LiYF₄: Ho³⁺ crystals

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Abstract

Laser-polarimetric technique with the shot-noise-limited polarimetric sensitivity is used to study magnetic ac-susceptibility in holmium doped LiYF₄ crystals in the range of Zeeman energies comparable with that of the hyperfine interaction in Ho³⁺ ions. Specific features of optical methods of magnetic measurements, the experimental setup, and results of measurements are discussed. Polarimetric sensitivity of the setup ($\sim 10^{-8}$ rad) allowed us to measure the ac-susceptibility of LiYF₄ single crystals containing 0.1-0.3 mol % of impurity Ho³⁺ ions with the signal-to-noise ratio exceeding 102. The obtained field-strength and frequency dependences of the ac-susceptibility show that the resonant peaks of the susceptibility mainly result from cross-relaxation transitions between the electronic-nuclear sublevels of Ho³⁺ ions. © 2008 Pleiades Publishing, Ltd.

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