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Title:Control of magnetic dipole terahertz radiation by cavity-based phase modulation
Authors:Li, J. (1); Higuchi, T. (1); Kanda, N. (1); Konishi, K. (1); Tikhodeev, S.G. (3); Kuwata-Gonokami, M. (1)
Author affiliation:(1) Department of Applied Physics, University of Tokyo and CREST-JST, 7-3-1 Hongo, Bunkyo-ku, Tokyo, 113-8656, Japan; (2) Photon Science Center, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo, 113-8656, Japan; (3) A. M. Prokhorov General Physics Institute, Russian Academy of Sciences, Vavilova Street 38, Moscow 119991, Russia; (4) Department of Physics, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo, 113-0033, Japan
Corresponding author:Li, J.
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Abstract:Although it is well accepted that the ultrafast manipulation of spins or magnetization in solid promises potential applications in coherent terahertz (THz) radiation source, spintronics and quantum information processing, their performance is significantly limited by the weak coupling between radiation field and magnetic dipole oscillation. For such 'weak' magnetic system, we propose an effective and simple route based on the cavity-based phase modulation technique towards the efficient energy extraction, demonstrated via controlling the magnetic dipole THz radiation generated in the nonlinear Raman process from antiferromagnetic (AFM) NiO. An asymmetric coupled Fabry-Pérot;rot (FP) cavity is constituted by simply placing a metallic planar mirror in the vicinity of a NiO slab. The energy-extraction (THz radiation) can be effectively manipulated by changing the NiO-mirror distance to modulate the phase relation between the magnetic wave and the induced magnetization in NiO. The distinct radiation control can be observed and the experiments are well explained by numerically analyzing the radiation dynamics that highlights the role of phase modulation during the radiation process.
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