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Theory of spin hot pockets in laser-induced demagnetization in ferromagnetic nickel[1] GUOPING ZHANG, Department of Physics, Indiana State University, MINGSU SI, Lanzhou University, YIHUA BAI, Center for Instruction, Research and Technology, Indiana State University, THOMAS F. GEORGE, University of Missouri-St. Louis — We will first review the current theory of the demagnetization process, with a particular focus on two distinctive contributions: (a) the optical dipole interaction (ODI) between a laser field and a magnetic system and (b) the spin expectation value change (SEC) between two transition states. We then introduce a new optical spin operator, a product of SEC and ODI between transition states. In ferromagnetic nickel, our first-principles calculation demonstrates that the larger the value of optical spin operator is, the greater the dynamic spin moment change is. This simple operator is very useful, as it directly links the time-dependent spin moment change $\Delta M_z^{\mathbf{k}}(t)$ at every crystal-momentum $\mathbf{k}$ point to its intrinsic electronic structure and magnetic properties. Those hot spin pockets should be the focus of future research.

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