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Scattering Theory of Gilbert Damping ARNE BRATAAS, Norwegian University of Science and Technology, Department of Physics, NO-7491 Trondheim, Norway, YAROSLAV TSERKOVNYAK, University of California, Los Angeles, Department of Physics and Astronomy, CA 90095, USA, GERRIT E.W. BAUER, Delft University of Technology, Kavli Institute of NanoScience, Lorentzweg 1, 2628 CJ Delft, The Netherlands — Magnetization relaxation is a collective many-body phenomenon that remains intriguing despite decades of theoretical and experimental investigations. It is important in topics of current interest since it determines the magnetization dynamics in magnetic memory devices and state-of-the-art magnetoelectronics experiments on current-induced magnetization dynamics [1]. We study the magnetization dynamics of a single domain ferromagnet in contact with a thermal bath by scattering theory. We recover the Landau-Lifshitz-Gilbert equation and express the Gilbert damping tensor in terms of the scattering matrix [2]. Dissipation of magnetic energy equals energy current pumped out of the system by the time-dependent magnetization, with separable spin-relaxation induced bulk and spin-pumping generated interface contributions. In linear response, our scattering theory for the Gilbert damping tensor is equivalent with the Kubo formalism [1] M. Stiles and J. Miltat, Top. Appl. Phys. 101, 225 (2006), and references therein. [2] A. Brataas, Y. Tserkovnyak, and G. E. W. Bauer, Phys. Rev. Lett. 101, 037207 (2008).

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