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Optically engineering the topological properties of helical edge states JÉRÔME CAYSSOL[1], Max-Planck-Institut für Physik komplexer Systeme, Nöthnitzer Str. 38, 01187 Dresden, Germany, BALÁZS DÓRA, FERENC SIMON, Department of Physics, Budapest University of Technology and Economics, Budafoki út 8, 1111 Budapest, Hungary, RODERICH MOESSNER, Max-Planck-Institut für Physik komplexer Systeme, Nöthnitzer Str. 38, 01187 Dresden, Germany — Time-periodic perturbations can be used to engineer topological properties of matter by altering the Floquet band structure. This is demonstrated for the helical edge state of a spin Hall insulator in the presence of monochromatic circularly polarized light. We first demonstrate that the inherent spin structure of the edge state is influenced by the Zeeman coupling and not by the orbital effect. The photocurrent (and the magnetization along the edge) develops a finite, helicity dependent expectation value and turns from dissipationless to dissipative with increasing radiation frequency, signalling a change in the topological properties. The connection with Thouless' charge pumping and non-equilibrium Zitterbewegung is discussed, together with possible experiments. B. Dora, J. Cayssol, F. Simon, and R. Moessner, Optically engineering the topological properties of a spin Hall insulator, arXiv:1105.5963

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