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Light-induced phase transition in a quantum spin chain: Breakdown of the Haldane phase by circularly polarized laser SHINTARO TAKAYOSHI, Department of Applied Physics, University of Tokyo, HIDEO AOKI, Department of Physics, University of Tokyo, TAKASHI OKA, Department of Applied Physics, University of Tokyo — We theoretically propose a new category of non-equilibrium phase transitions in quantum spin systems that can be induced by the magnetic component of strong lasers. As an example, we consider a Haldane chain with single ion anisotropy radiated by circularly polarized light. We study the spin dynamics by combining the numerical infinite time-evolving block decimation method and an analytical calculation via the Floquet theory, and demonstrate that the laser can magnetize even an antiferromagnet quantum mechanically. It is also shown that the string order is broken by the magnetization, which indicates that a photo-induced breakdown of the Haldane phase has occurred. This phenomenon can be realized using strong THz lasers.

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