Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Magnetization process and topological plateau phase induced by circularly polarized laser SHINTARO TAKAYOSHI, National Institute for Materials Science, MASAHIRO SATO, Aoyama-Gakuin University, TAKASHI OKA, The University of Tokyo — One of the fundamental experiments to investigate magnetic properties of materials is a measurement of magnetization curve. Antiferromagnets with large exchange couplings, however, need high external field to achieve their saturated magnetization, and large equipment is required in experiments. We theoretically propose a new and dynamic way to realize magnetization processes of general quantum magnets without any static field. The way is to apply a circularly polarized laser to magnetic systems. We can show that the coupling between the laser and magnets is mapped to an effective static Zeeman term with a longitudinal magnetic field via a time-dependent unitary transformation or Floquet theory. It is hence expected that the magnetization curve of magnets can be realized by applying a suitable laser. We demonstrate dynamical magnetization processes by numerically solving Schrödinger equations for concrete quantum spin models under applied lasers. We also show that a laser-induced magnetization plateau state appears in a simple Ferro-Ferro-Antiferro spin chain model under a certain condition and it has a topological nature.

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Date submitted: 14 Nov 2013 Electronic form version 1.4