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Polarization induced Z_2 and Chern topological phases in a periodically driving field SHU-TING PI, SERGEY SAVRASOV, Univ of California - Davis — Z_2 and Chern topological phases such as newly discovered quantum spin Hall and original quantum Hall states hardly both co–exist in a single material due to their contradictory requirement on the time–reversal symmetry (TRS). We show that although the TRS is broken in systems with a periodically driving field, an effective TRS can still be defined provided the ac–field is linearly polarized or certain other conditions are satisfied. The controllable TRS provides us a route to manipulate contradictory phases by tuning the polarization. To demonstrate the idea, we consider a tight-binding model that is relevant to several monolayered materials as a benchmark system. Our calculation shows not only topological Z_2 to Chern phase transition occurs but rich Chern phases are also observed. In addition, we also discussed the realization of our proposal in real materials, such as spin-orbit coupled graphene and crystal Bismuth. This opens the possibility of manipulating various topological phases in a single material and can be a promising approach to engineer new electronic states of matter.

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