

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Signatures of topological phase transition in 3d topological insulators from dynamical axion response IMAM MAKHFUDZ, Laboratory of Physics Ecole Normale Supérieure de Lyon France — Axion electrodynamics, first proposed in the context of particle physics, manifests itself in condensed matter physics in the topological field theory description of 3d topological insulators and gives rise to magnetoelectric effect, where applying magnetic (electric) field $\mathbf{B}(\mathbf{E})$ induces polarization (magnetization) $\mathbf{p}(\mathbf{m})$. We use linear response theory to study the associated topological current using the Fu-Kane-Mele model of 3d topological insulators in the presence of time-dependent uniform weak magnetic field. By computing the dynamical current susceptibility $\chi_{ij}^{\mathbf{j}_p \mathbf{j}_p}(\omega)$, we discover from its static limit an ‘order parameter’ of the topological phase transition between weak topological (or ordinary) insulator and strong topological insulator, found to be continuous. The $\chi_{ij}^{\mathbf{j}_p \mathbf{j}_p}(\omega)$ shows a sign-changing singularity at a critical frequency with suppressed strength in the topological insulating state. Our results can be verified in current noise experiment on 3d TI candidate materials for the detection of such topological phase transition.

Imam Makhfudz
Laboratory of Physics Ecole Normale Supérieure de Lyon France

Date submitted: 04 Nov 2016

Electronic form version 1.4