Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Transient many-body instability in driven Dirac materials. ANNA PERTSOVA, CHRISTOPHER TRIOLA, Nordita, KTH Royal Institute of Technology and Stockholm University, ALEXANDER BALATSKY, Nordita, KTH Royal Institute of Technology and Stockholm University; Institute for Materials Science, Los Alamos National Laboratory, USA — The defining feature of a Dirac material (DM) is the presence of nodes in the low-energy excitation spectrum leading to a strong energy dependence of the density of states (DOS). The vanishing of the DOS at the nodal point implies a very low effective coupling constant which leads to stability of the node against electron-electron interactions. Non-equilibrium or driven DM, in which the DOS and hence the effective coupling can be controlled by external drive, offer a new platform for investigating collective instabilities. In this work, we discuss the possibility of realizing transient collective states in driven DMs. Motivated by recent pump-probe experiments which demonstrate the existence of long-lived photo-excited states in DMs, we consider an example of a transient excitonic instability in an optically-pumped DM. We identify experimental signatures of the transient excitonic condensate and provide estimates of the critical temperatures and lifetimes of these states for few important examples of DMs, such as single-layer graphene and topological-insulator surfaces.

Anna Pertsova
Nordita, KTH Royal Institute of Technology and Stockholm University

Date submitted: 11 Nov 2016 Electronic form version 1.4