Abstract Submitted
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Atomic and Excitonic Stability in Dirac Materials: A White Dwarf Perspective[1] KIRILL VELIZHANIN, Los Alamos National Laboratory — Dirac materials - systems where the low-energy spectrum of electronic excitations can be understood via solving the Dirac equation - draw a great amount of attention of the scientific community lately due to their enormous application potential and interesting basic physics. Examples of such materials include carbon nanotubes, graphene and, more recently, single-layer transition metal dichalcogenides. One surprising application of Dirac materials is their use as a platform to simulate various atomic and high-energy physics "on a chip." For example, graphene has been recently used to "mimic" an atomic collapse of superheavy atoms [Y. Wang et al, Science, 340, 734, 2013]. In this talk I will discuss an unexpected similarity between atomic and excitonic collapse in Dirac materials and the limit of stability of such exotic astrophysical objects as degenerate stars (e.g., white dwarfs, neutron stars). Various aspects of this similarity, e.g., an application of the concept of the Chandrasekhar limit to the exciton stability in transition metal dichalcogenides, will be discussed.

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