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**Nonlinear optical response and Schwinger mechanism in a 3D Dirac system via gauge/gravity duality** TAKASHI OKA, University of Tokyo, AKIHIKO SONODA, KOJI HASHIMOTO, Osaka University — Dirac electrons realised in solid states show many exotic quantum phenomena. We study theoretically the nonlinear response of 3D Dirac materials in electro-magnetic fields such as the production of electron-hole pairs via quantum tunneling, i.e., Schwinger mechanism (=Zener breakdown), and birefringence. This is done by calculating the Euler-Heisenberg Lagrangian, which is the generating function of nonlinear optical response coefficients ([1] is a review). We also study the effect of correlation with a QCD-like toy model using gauge-gravity duality [2] and find universal relations that are accessible with solid state experiments. [1] T. Oka, and H. Aoki, ?Nonequilibrium Quantum Breakdown in a Strongly Correlated Electron System?, LNP Springer (2008). [2] K. Hashimoto, T. Oka, JHEP 10, 116 (2013).

Takashi Oka  
University of Tokyo

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