

Abstract Submitted
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The Over-Barrier Emission Model for a Vertically-Aligned Single-Layer Graphene Sheet¹ SHI-JUN LIANG, Singapore University of Technology & Design, LAY KEE ANG, Singapore University of Technology & Design and Nanyang Technological University — It is believed the unique properties of graphene make it an ideal emitter. Traditionally, the mechanism of electron field emission of materials is governed by Fowler-Nordheim Law (F-N law) [1]. Even some experimental researchers have employed the F-N law to study electron field emission of graphene. However, it is well-known that the F-N law was established under the situation of 3D materials, but graphene is quasi-2D material. Thus the usage of F-N law is incorrect for this case. What's more, our previous paper [2] has verified that the conventional F-N law is no longer valid in the case of single layer graphene. In the paper we present an electron emission mechanism of graphene — over-barrier emission. The relativistic WKB method has been used to approximately calculate the tunneling probability and current density, by considering electron walking through two different barrier regions. After some calculations we found that the electron over-barrier emission of graphene can be tuned by a parameter determined over a wide range of relevant laser parameters.

[1] R. H. Fowler and L. Nordheim, Proc. R. Soc. London Ser. A 119, 173 (1928).

[2] S. Sun, L. K. Ang, D. Shiffler, J. W. Luginsland, Appl. Phys. Lett. 99, 013112 (2011).

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