

Signature of Schwinger's pair creation rate via radiation generated in graphene by a strong electric current

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Due to Landau-Zener interband tunneling electron - hole pairs are copiously created by an applied electric field near the Dirac point in graphene. It is shown that for electric fields $E > \hbar v_g / eL^2$, where L is the length of the sample, the I-V characteristics become strongly nonlinear due to Schwinger's pair creation rate, proportional to $E^{3/2}$. At recently achievable fields the radiation from the pairs' annihilation becomes observable. The spectrum of radiation is calculated and exhibits a maximum at $\omega = \sqrt{eEv_g/\hbar}$. The angular and polarization dependence of the emitted photons with respect to the graphene sheet is quite distinctive.