Capacitor Discharge and Vacuum Resistance in Massless QED_2

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A charged parallel plate capacitor will create particle-antiparticle pairs by the Schwinger process and discharge over time. We consider the full quantum discharge process in 1+1 dimensions including backreaction, when the electric field interacts with massless charged fermions. We recover oscillatory features in the electric field observed in a semiclassical analysis and find that t amplitude of the oscillations falls off as t^{-1/2} and that stronger coupling implies slower decay. Remarkably, Ohm's law applies to the vacuum and we evaluate the quantum electrical conductivity of the vacuum to be 2e/\pi^{1/2}, where e is the fermionic charge. Similarities and differences with black hole evaporation are mentioned.

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