

Title: Quantum effects in strong classical fields: the high intensity frontier

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Abstract:

Spontaneous electron-positron pair production from classical electric fields has waited >60 years for experimental confirmation. The basic mechanism, derived in quantum electrodynamics, has been invoked in many other areas: quark-anti-quark cascades and thermalization in the early stages of hadron collisions, Hawking radiation, and particle creation in the expanding universe to name a few. Newly developed high-intensity lasers like the Texas Petawatt offer a new hope in the search for spontaneous pair production. I will describe several additional challenges of classical and quantum particle dynamics in strong fields that we must encounter and solve along the way, including classical radiation reaction, quantum radiation and the need for a quantum kinetic theory, and the possibility of classical acceleration effects -- do electrons in strong fields see an event horizon?