Abstract Submitted
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Enhanced Pair Production in Multicenter Systems by Super-Intense Lasers[1] ANDRE BANDRAUK, Universite de Sherbrooke — Electron-positron(e-e+) pair production is considered for many-center systems with multiple bare nuclei immersed in intense static electric fields corresponding to the extrema of electric fields planned by future super intense laser pulse sources with intensities I>10^{24} W/cm^2. It is shown analytically using an exactly solvable 1-D delta potential model [1] in a multicenter Dirac equation that there are two distinct regimes where pair production rates are enhanced.At small internuclear distances, the effective nuclear charge approaches the critical charge where the ground state dives into the negative continuum of the Dirac equation.At large atomic distances a new mechanism is predicted,similar to Charge Resonance Enhanced Ionization of molecules by intense, I $\sim 10^{24}$ W/cm^2, laser pulses [2]. Multicenter resonances from the negative energy states are shown to cross into the positive energy states due to large field induced Stark shifts thus resulting in a resonantly enhanced pair production mechanism. A numerical method is developed to calculate the pair production rates from the multicenter Dirac equation. The latter is evaluated for systems (clusters) up to five nuclei of large charge. It is shown that the pair production rate for multicenter systems in superintense electric fields generally exceeds by orders of magnitudes the Schwinger tunneling rate which requires intensities of $\sim 10^{29}$ W"/cm^2. [1] F Fillion-Gourdeau, E Lorin, A D Bandrauk, Phys Rev Lett 110,013002(2013); J Phys B 46,175002 (2013). [2] A D Bandrauk,F Legare, in "Progress in Ultrafast Intense Laser Science", VIII, edit K Yamanouchi et al,(Springer, Berlin, 2012) p 29-46.

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