Heavy ion induced e^+e^- pair production: Theoretical and preliminary experimental efforts

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The production of real e+e- pairs is an important quantum electrodynamics phenomenon, that could have significant implications on low energy heavy ion dynamics. Here, we employ an established Schwinger inspired theory to study this effect in nuclear disintegrations. We extend the current framework with a Monte Carlo approach to include non-perturbative contributions. Simultaneously, we supplement our study with a preliminary experimental procedure, via the use of the Global Spectrometer for Positron and Electron Characterization developed at the Texas Petawatt Laser facility of the University of Texas at Austin. Our resulting positron spectra are shown in Fig. 1. We observe that, theory and experiment agree within one order of magnitude, which signals promise for further investigations.

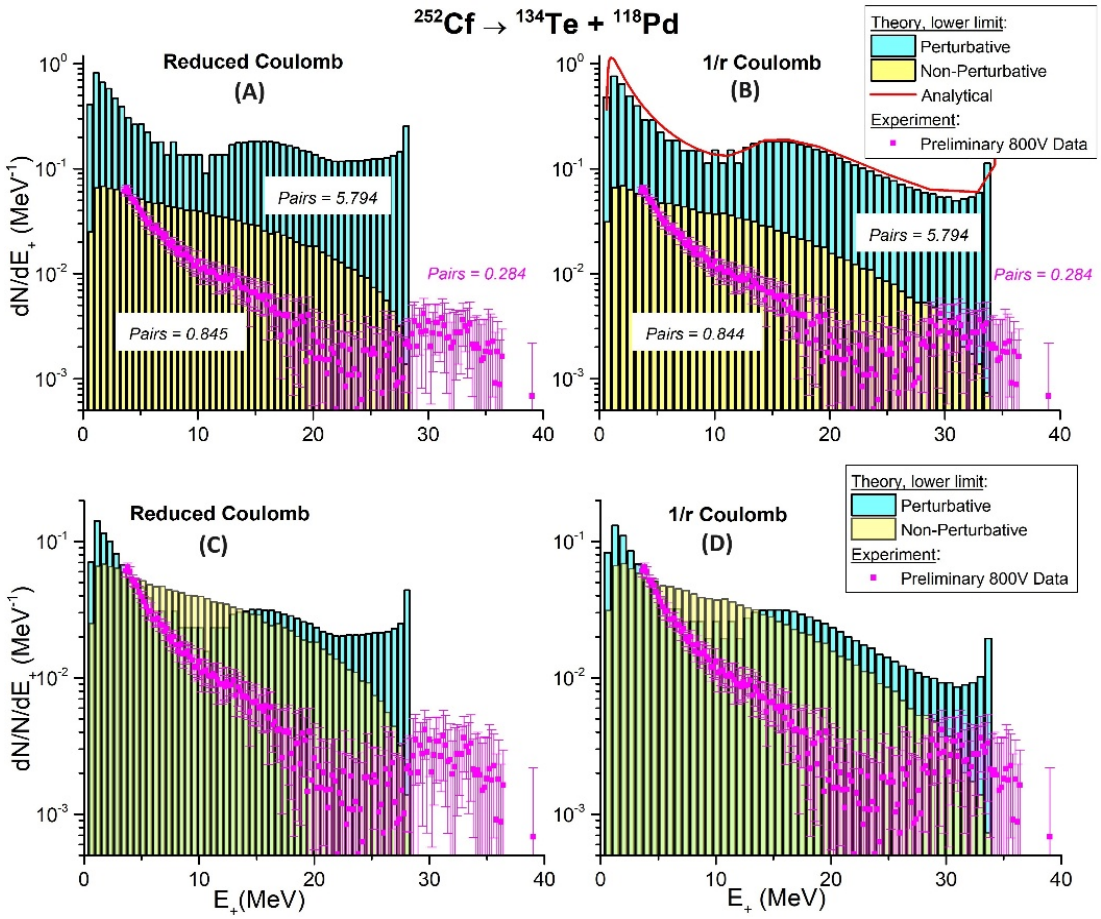

Fig. 1. (Color online) Positron spectra of 252Cf asymmetric fission decay, using the reduced (panels A, C) and the 1/r (panels B, D) Coulomb potential. The theoretical (perturbative, non-perturbative and analytical from Ref. [3]) and experimental data, are shown according to the key. The perturbative data are normalized to unity in the bottom row.

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