

Abstract Submitted  
for the APR08 Meeting of  
The American Physical Society

**Pair production in non-uniform electric fields** HAGEN KLEINERT, REMO RUFFINI, SHE-SHENG XUE, ICRANet and University of Rome “Sapienza” — Treating the production of electron and positron pairs in vacuum by a strong electric field as a quantum tunneling process, we derive in semiclassical approximation the pair production rate for nonuniform fields  $E(z)$  pointing the  $z$ -direction. In addition, we discuss tunneling processes in which an empty atomic bound state is spontaneously filled with a negative-energy electron creating a positron. The general expression is applied to a confined field, a semi-confined field, and a linearly increasing field. The boundary effects of the confined fields on pair-production rates are explicitly evaluated. Finally, we calculate the rate at which the atomic level of a bare nucleus of finite size and large  $Z$  are filled by electrons from the vacuum under positrons emission.

Hagen Kleinert  
ICRANet and University of Rome “Sapienza”

Date submitted: 15 Jan 2008

Electronic form version 1.4