Generalized Gelfand-Dikii Equation for Fermionic Schwinger Pair Production

N Ahmadiniaz[1], S P Kim[2,3], and C Schubert[4]

[1] *Theoretical Physics, Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany*
[2] *Department of Physics, Kunsan National University, Kunsan, South Korea*
[3] *Center for Relativistic Laser Science, Institute for Basic Science, Gwangju, South Korea*
[4] *Instituto de Física y Matemáticas , Universidad Michoacana de San Nicolás de Hidalgo, Morelia, Mexico*
Contact Email: christian.schubert@umich.mx

Schwinger pair creation in a purely time-dependent electric field can be reduced to an effective quantum mechanical problem using a variety of formalisms. Here we develop an approach based on the Gelfand-Dikii equation for scalar QED and a generalization of that equation for spinor QED. We discuss a number of solvable special cases from this point of view. In previous work, two authors had shown for the scalar case how to use the well-known solitonic solutions of the KdV equation to construct Pöschl-Teller like electric fields that do not pair create at some fixed but arbitrary momentum. Here, we find that this construction can be adapted to the fermionic case by a mere change of parameters.