Evaluated electron and positron-molecule scattering data for modelling particle transport in the energy range 0-10000 eV

F. Blanco[1], A. Muñoz[2], F. Ferreira da Silva[3], P. Limão-Vieira[3] and G. García[4, 5]

[1]Departamento de Física Atómica, Molecular y Nuclear, Universidad Complutense de Madrid, 28040 Madrid, Spain

[2] Centro de Investigaciones Energéticas Medioambientales y Tecnológicas, Avenida Complutense 22, 28040 Madrid, Spain

[3]Laboratório de Colisões Atómicas e Moleculares, CEFITEC, Departamento de Física, Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa, 2829-516 Caparica, Portugal

[4]Instituto de Física Fundamental, Consejo Superior de Investigaciones Científicas, Serrano 113-bis, 28006 Madrid, Spain.

[5]Centre for Medical Radiation Physics, University of Wollongong, Wollongong, NSW 2522, Australia.

Particle transport in molecular media, both liquids and gases, and radiation damage are customary modelled using atomic scattering data based on the Born-Bethe theory [1]. However, this approach tends to overestimate electron and positron scattering cross sections for incident energies below 10000 eV, especially for elastic processes. Here we present a method to obtain evaluated electron and positron scattering data for some molecular prototypes (N2, CH4, H2O) by combining experimental and theoretical methods, validated within their corresponding energy range of applicability, in order to achieve a consistent data set over a broad energy range (0-10000 eV).

These data are used as input parameters for an event by event Monte Carlo simulation procedure [2] which will be applied to some validating experiments. The assigned uncertainty limits for the input data will be checked by comparing the observed results with the predictions of the simulation. Possible applications to model transport processes in fusion plasmas will be also discussed.

[1] S.T. Perkins, D. E. Cullen, S. M. Seltzer, *Tables and graphs of electron-interaction cross sections from 10 eV to 100 GeV derived from the LLNL evaluated electron data library (EEDL), Z=1-100*, Laurence Livermore National Laboratory (University of California, California 1991).

[2] G. García and M. C. Fuss, Editors, *Radiation damage in biomolecular systems* (Springer, London 2012).