DATA BASES FOR COLLISIONS AND TRANSPORT OF ELECTRONS AND POSITRONS IN IONIZED GASES

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Non-equilibrium plasmas are ofthen thought to be a man-made system aimed at favouring energy transfer ot electrons while ions and neutral particles remain at low, even room temperature. Those plasmas may be found in panetary atmospheres, interstellar coronas and gas clouds. Those plasmas however represent the basis for numerous down to earth application such as plasma processing for micro and nano electronics, plasma medical applications, plasmas in nanotechnologies and many more.

Any modeling of such plasmas is based on phenomenology, data and theoretical apparatus taken from the physics of swarms (i.e. physics of non interacting charged particles in unperturbed ionized gases). Even the techniques such as PIC or fully kinetic calculations that rely on the cross sections only need a swarm analysis to test whether the number, momentum and energy balances are fullfilled.

Data sets used in modeling of such plasmas have to be comprehensive. That means that they have to cover a wide range of energies from thermal to maximum avalable energy as often runaway phenomena occur. They have to include all processes and in different energy ranges different inelastic processes dominate the energy balance. Number changing collisions (attachment, ionization, etc.) affect the definition of transport coefficients and significant differences may occur between calculated and experimental data unless proper care of those processes is taken. The codes used in calculations all have to be tested against well known and well defined benchmarks.

Comparisons of trasport data calculated with the cross section set and those measured provide tests of whether overall balances are made but may lead to non-unique resulting cross sections, poor energy resolution and efefcts due to compensation of the processes below and above the energy range that is well covered by the swarm experiment. Thus the best strategy is to apply shapes of the cross sections from binary experiments and theories and use the swarm analysis to normalize them a to fill the missing processes.Typical error is in representing ionization, surely a critical parameter in any self sustained plasma.

In this talk we shall make a survey of the available data bases, how to use the binary collision data in plasma modeling and swarm analysis, different applications and finally we shall give some examples for data bases for positrons.