Electron transport in mercury vapor: magnetic field effects, dimer induced NDC and multi-term analysis ZORAN PETROVIC, JASMINA MIRIC, ILIJA SIMONOVIC, SASA DUJKO, Institute of Physics, University of Belgrade, Serbia — A multi term theory for solving the Boltzmann equation and Monte Carlo simulation technique are used to investigate electron transport in varying configurations of electric and magnetic fields in mercury vapor. Using different sets of cross sections for electron scattering in mercury as an input in our Boltzmann and Monte Carlo codes, we have calculated data for electron transport as a function of reduced electric and magnetic fields. A multitude of kinetic phenomena in electron transport has been observed and discussed using physical arguments. In particular, we discuss two important phenomena: (1) for certain values of electric and magnetic field, we find regions where swarm mean energy increases with increasing magnetic field for a fixed electric field, and (2) the occurrence of negative differential conductivity (NDC) for higher pressures and temperatures. In particular, NDC is induced by the presence of mercury dimers. The measured drift velocities agree very well with our Monte Carlo results only if the superelastic collisions are included in our calculations. Spatially-resolved electron transport properties are calculated using a Monte Carlo simulation technique in order to understand these phenomena.

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