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Third-order transport coefficients for electron and positron swarms in gases ILIJA SIMONOVIC, SASA DUJKO, Institute of physics, University of Belgrade, 11080 Belgrade, Serbia, RONALD WHITE, James Cook University, Townswille, Australia, ZORAN PETROVIC, Institute of physics, University of Belgrade, 11080 Belgrade, Serbia — A multi term solution of the Boltzmann equation has been used to calculate third-order transport coefficients of charged particle swarms in neutral gases under the influence of electric and magnetic fields. The hierarchy resulting from a spherical harmonic decomposition of the Boltzmann equation in the hydrodynamic regime is solved numerically by representing the speed dependence of the phase-space distribution function in terms of an expansion in Sonine polynomials about a Maxwellian velocity distribution at an internally determined temperature. A group projector technique is employed to determine the structure and symmetries along individual elements of the skewness tensor when both electric and magnetic fields are present. Results are given for electron and positron swarms for certain model and real gases over a range of electric and magnetic field strengths. The results of the Boltzmann equation analysis are compared with those obtained by a Monte Carlo simulation technique. Various aspects in the behavior of skewness tensor elements are investigated, including the existence of correlation with low-order transport coefficients, sensitivity to post-ionization energy partitioning and errors of two-term approximation for solving Boltzmann's equation.

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