Drift velocity of the electron transport in RF elelectromagnetic field in N_2 gas

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INTRODUCTION

The research topic is calculation of the drift velocity of electron transport in N_2 gas under the influence of an external crossed electromagnetic field, *E* x *B*. A Monte Carlo simulation code has been used to obtain non-equilibrium electron energy distribution function within one oscillation of external crossed fields. In order to test our simulation code validity under the condition of crossed RF electric and RF magnetic fields, we compared drift velocity components of electron transport in Reid's model gas with the available literature data.

MONTE CARLO SIMULATION

Monte Carlo simulation code has been used for simulating the electron transport through CO_2 gas in the presence of external crossed fields. At the initial moment all the molecules are at their vibrational, rotational and electronic ground states (they are assumed to be at zero temperature). After each time step, dt, the simulation determines electron positions and velocities by using the numerical iterative method. After quasi steady state is reached the EEDFs are sampled in each dt and averaged within many periods.

RESULT

The results could be seen on the figures 1 and 2 where, in simulation, *E* is aligned with the z-axis, while *B* is parallel with y-axis. Fig.1. shows the transversal drift velocity (V_x, in *E*×*B* direction) obtained by our simulation and obtained by Petrovic et al., with their Monte Carlo code. The calculation was performed for the frequency of 50 MHz, reduced electric field of 14 Td while the reduced magnetic field value was 500 Hx. One can clearly see the excellent matching of the compared velocities which proves the validity of our code.

According to the results of that comparison, we have been encouraged to research and calculate the drift velocity components of electron transport in real N_2 gas. These results are shown in the figure 2, obtained under the condition of reduced electric field, E/N, of 100 Td, frequency of 100 MHz and reduced magnetic field, B/N, of 1000 Hx.

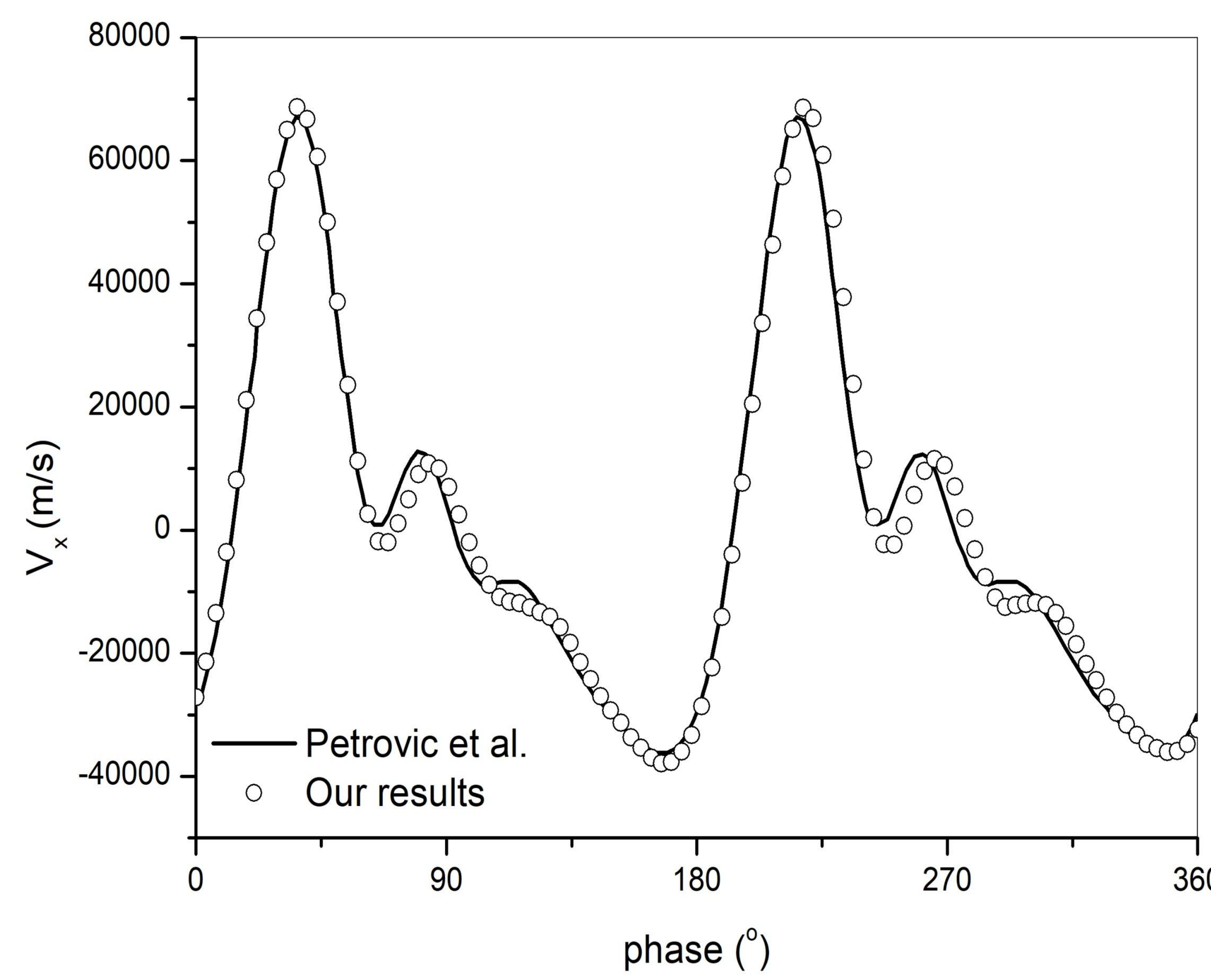

Fig1. Velocity drifts of electron transport in Reid's model gas

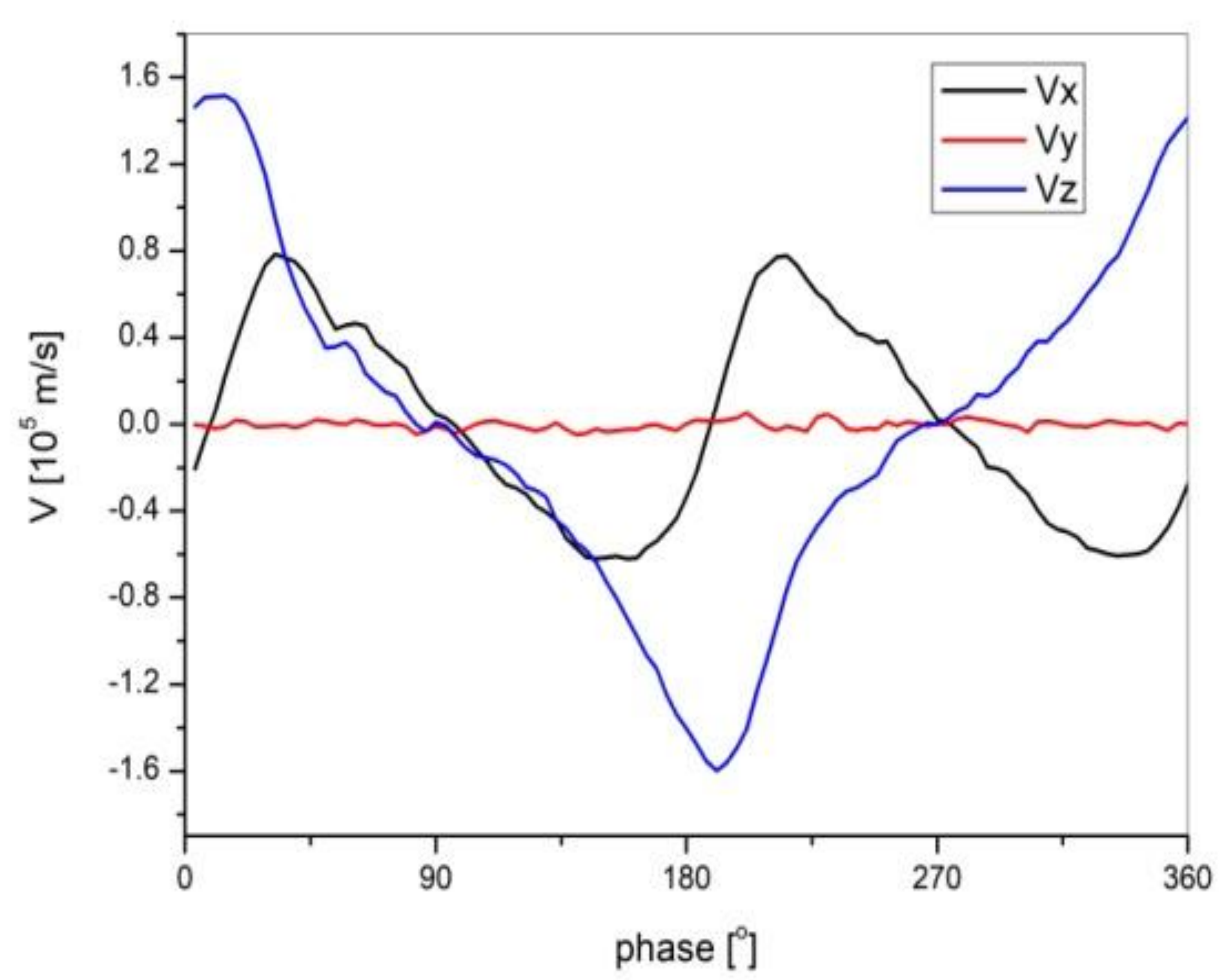

Fig2. Velocity drifts of electronic transport in N_2 gas

CONCLUSION

Velocity drifts of electron transport in Reid's model gas have a satisfactory match with the compared results. Considering the code validity has been proven, the possibility of investigating the kinematics of electrons in the working gas has opened up.

REFERENCE:

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