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SOME RESULTS OF STOCHASTIC PLASMA THEORY *)

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The results are presented and a review of theoretical studies is given using the stochastic theory of turbulence, which is based on stochastic differential equations and the equivalence of measures between deterministic and random fields [1,2], for turbulent plasma heated by a strong electric field. Calculations based on statistical theories did not give such results. Stochastic equations for plasma in an electric field, presented in [1,2], were solved. Hydrogen plasma with a temperature of up to Te ~ 10,000 Ev in the region of an external strong electric field 1 < E < 1000 V/cm was considered.

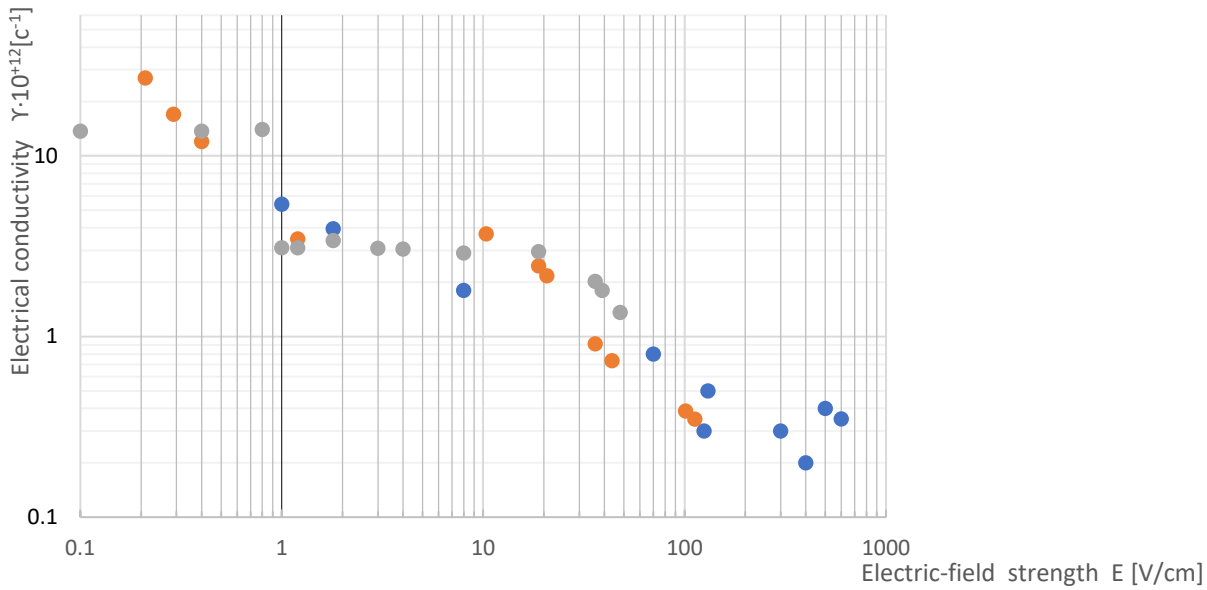

Figure 1. Plasma conductivity as a function of electric-field strength for hydrogen according to data [3] (blue mark),,[4] (grey mark); stochastic theory (red) [1,2]

For the first time, agreement was obtained between theoretical dependences and experimental data [3,4] on plasma conductivity Fig. 1. It was shown that after the occurrence of plasma turbulence, the existing experimental data have a certain scatter of ~30% for a strong electric field of 1<E<1000 V/cm; see data [3,4]. Based on stochastic equations for experimental values of electron density and temperature, plasma current and conductivity, the drift velocity, collision frequency, Coulomb integral and wave number (turbulence scale) were also theoretically determined.

References

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