Abstract Submitted
for the GEC10 Meeting of
The American Physical Society

Non-local effects in spatial distribution of excitation rates and differential electron fluxes in positive column of glow discharge plasma at moderate and high pressures[1] EUGENE BOGDANOV, KIRILL KAPUSTIN, ANATOLY KUDRYAVTSEV, LEV TSENDIN, St.Petersburg State University — At simulations of gas-discharge plasmas the EDF is usually calculated using the local approximation (LA) which is applicable only when electron energy relaxation length le << R - plasma size. For atomic gases le >100*l (l - electron free-path-length), so the LA for EDF is not valid up to high gas pressures. Differential fluxes of electron with defined energy have complicated spatial distribution related to the nonlocal character of the EDF. In case of elastic energy balance of electrons, the direction of the differential electron flux also essentially depends on the energy dependence of the elastic scattering cross section. If this cross-section increases with energy, electrons would increase their energy only on the periphery of the discharge. While near the discharge axis, where the kinetic energy of electrons and hence the frictional force due to elastic collisions is maximum, the differential flow is directed towards reducing the energy, i.e. against the direction of heating electric field. The paradoxical nonmonotonic behavior of spatial profiles of excitation rates in DC positive column plasmas bounded plasmas was revealed.

[1]Supported by the AVZP and the FZP NK-110P.

Anatoly Kudryavtsev
St.Petersburg State University

Date submitted: 11 Jun 2010 Electronic form version 1.4