

Abstract Submitted
for the GEC16 Meeting of
The American Physical Society

Screening in humid air plasmas¹ ANATOLY FILIPPOV, SRC RF Troitsk Institute for Innovation and Fusion Research, 142190 Troitsk, Moscow, Russia, IVAN DERBENEV, School of Chemistry, University of Nottingham, University Park, Nottingham NG7 2RD, United Kingdom, NIKOLAY DYATKO, SERGEY KURKIN, SRC RF Troitsk Institute for Innovation and Fusion Research, 142190 Troitsk, Moscow, Russia — Low temperature air plasmas containing H₂O molecules are of high importance for atmospheric phenomena, climate control, biomedical applications, surface processing, and purification of air and water. Humid air plasma created by an external ionization source is a good model of the troposphere where ions are produced by the galactic cosmic rays and decay products of air and soil radioactive elements such as Rn²²². The present paper is devoted to study the ionic composition and the screening in an ionized humid air at atmospheric pressure and room temperature. The ionization rate is varied in the range of $10^1 - 10^{18} \text{ cm}^{-3}\text{s}^{-1}$. The humid air with 0 – 1.5% water admixture that corresponds to the relative humidity of 0 – 67% at the air temperature equal to 20°C is considered. The ionic composition is determined on the analysis of more than a hundred processes. The system of 41 non-steady state particle number balance equations is solved using the 4th order Runge-Kutta method. The screening of dust particle charge in the ionized humid air are studied within the diffusion-drift approach. The screening constants are well approximated by the inverse Debye length and characteristic lengths of recombination and attachment processes.

¹This work was supported by the Russian Science Foundation, project no.16-12-10424.

Anatoly Filippov
SRC RF Troitsk Institute for Innovation and Fusion Research, 142190 Troitsk, Moscow, Russia

Date submitted: 09 Jun 2016

Electronic form version 1.4