Plasma plates method in the numerical simulation of the relativistic electron bunches spreading in the upper ionosphere

V.V. Kurnosov[1], E.L. Stupitzki[2]

[1-2] *Central Institute of Physics and Technology, Sergiev Posad, Russia*

In terms of plasma plates method the large-scale current system parameters in the upper ionosphere is investigated. This current system arise from the beta-electrons stream spreading along the geomagnetic field lines force from the expanding spherical plasma source at the altitude 300 [km]. The geomagnetic field lines force slope to the earth surface is about 60^0.

The problem is solved by means of the self-consistent approximation. That is, the longitudinal electric field is taking into account, since it has influence to the electrons moving. To take into account the ionization losses the universal approximation formula was derived. The numerical results show that under the relatively small plates number (<100) the current region structure is reproduced qualitatively right. Nevertheless, the essential adding of the plates (up to 10^4) lets us to observe in detail the all current system characteristics as at the time of coming out to the quasi-steady regime as well as during the slowly transition of the charge distribution, electricity field and the energy characteristics.

The computations show that after the geomagnetic tube come out to the quasi-steady regime between the source and the region of electrons deceleration by the earth atmosphere (h = 40-60 [km]) the intense negative volume charge areas with different electrons energy are generated.

In the future, these areas dynamics defined by the source behavior forms the all current processes in the nearest ionosphere's region. Therefore, the current system long-term evolution is defined completely by the beta-electrons plasma source behavior.