ON THE UPPER LIMIT IN THE BOHM SHEATH CRITERIUM

I.A. Kotelnikov, D.I. Skovorodin, and V.T. Astrelin

Budker Institute of Nuclear Physics, Russian Academy of Sciencds, Novosibirsk, Russia, I.A.Kotelnikov@inp.nsk.su

Possible existence of an upper limit in the Bohm sheath criterion is discussed. According to classical Bohm’s criterion, stable sheath may exist at the plasma interface with negatively charged electrode if ion flux velocity exceeds the speed of ion sound. We note that, apart of few artificial models, the Bohm criterion is satisfied marginally in the form of equality and the ion flux velocity is equal to the ion-sound velocity. In one-dimensional theory, supersonic ion flow occurs in a not very realistic model of localized ion source with a size smaller than the Debye length. However, supersonic flow seems to be possible in two- and three-dimensional geometries. Numerical codes used for simulation of sources of charged particles do not assume existence of an upper limit in the Bohm criterion but *de facto* the results of simulation fit experimental data if the ion flux velocity is of order of the speed of ion sound.

References

1. Cohen R.H., Ryutov D.D., Contributions to Plasma Physics, 2004, 44, 111.
2. Far-Tech, Particle beam gun simulations, 2015, <http://far-tech.com/pbguns/>.
3. Astrelin V.T., Uspekhi prikladnoj fiziki, 2013, 1, 571.
4. Kotelnikov I.A., Astrelin V. T., Physics Uspekhi, 2015, 58, 701-718.
5. Dubinov A.E., Senilov L.A., Technical Physics Letters, 2011, 37, 900–903.