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This doc: mapOfMaximalImpactParameter.docx

**Maximal Impact Parameter**

As is known, maximal impact parameter is determined by the relation of several quantities: a radius  of neutralization, Debye screening radius  and a “flight radius” , characterized by the time flight through the region of interaction of an electron with an ion as well the radius  of the beam:



Radius of neutralization depends only on the density  of the electrons in the cooling beam:



The typical values of the density  are . In case of the collision with protons it leads to the corresponding values for  accordingly.

Debye screening radius  depends on the plasma frequency  and the relative velocity of ion and electron :



Usually , so that  and then



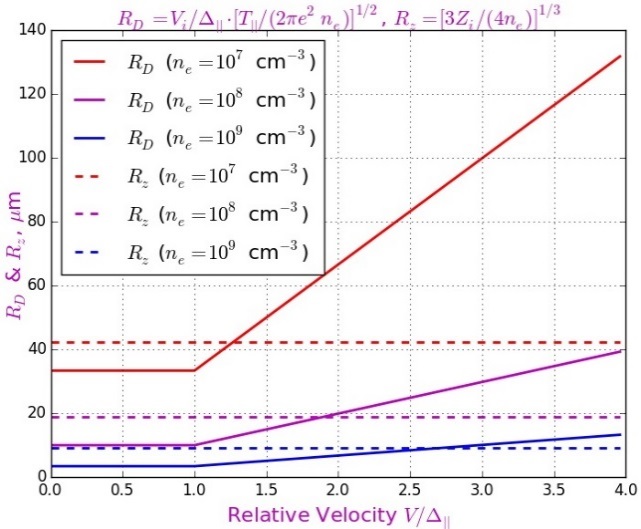
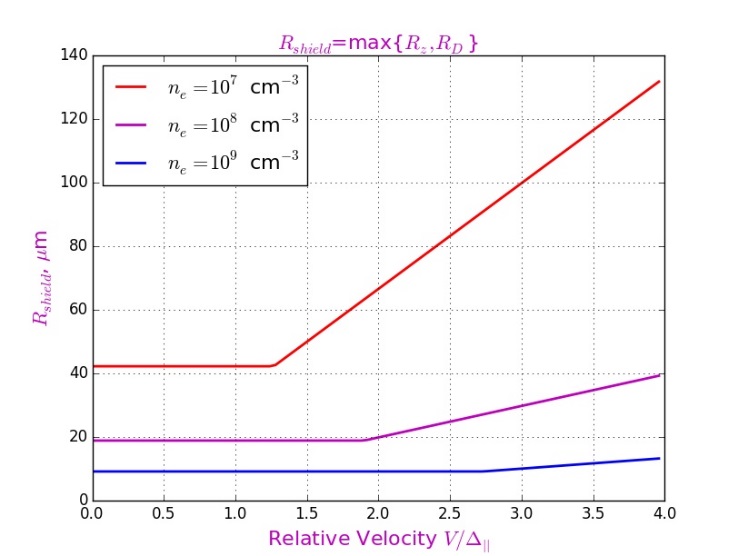
In these formulae  is the longitudinal mean square velocity, which is determined by the longitudinal temperature , while the dimensional (length) slope coefficient  characterizes the slope of linear dependences  on dimensionless ion velocity .

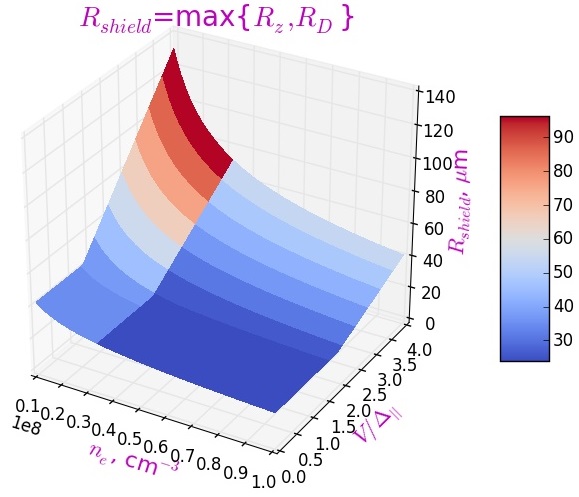
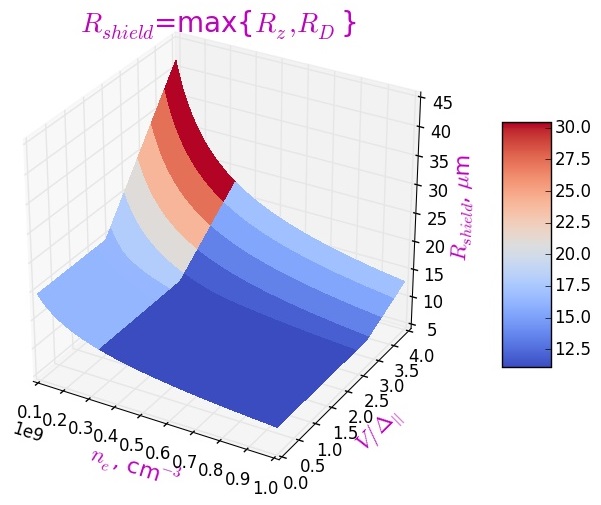
If , so that , then



For a typical value of longitudinal temperature the values of the slope coefficient  are  for  correspondingly.

The next set of Figures shows dependences of the radiuses  (for ) and  on the relative ion velocity for tree values of the beam density , the corresponding shielding radius  as well as 3D plot of  as the function of the relative ion velocity and the beam density (in two intervals of the density).

All these Figures show that the shielding radius  exceeds the level  only at very high beam densities and is usually less than about .

Let’s compare these values with the beam radius  and “flight radius” .

The first of them usually exceeds the value of the order of several mm and is extremely rarely below 1mm (). **Thus, the beam size never determines the value of the maximum of the impact parameter .**