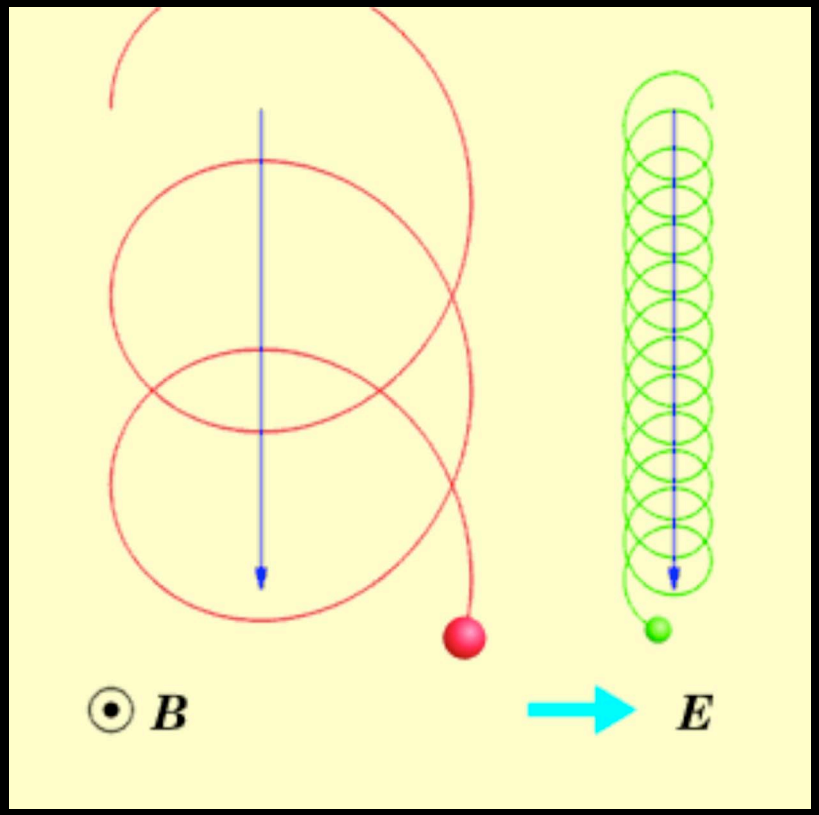
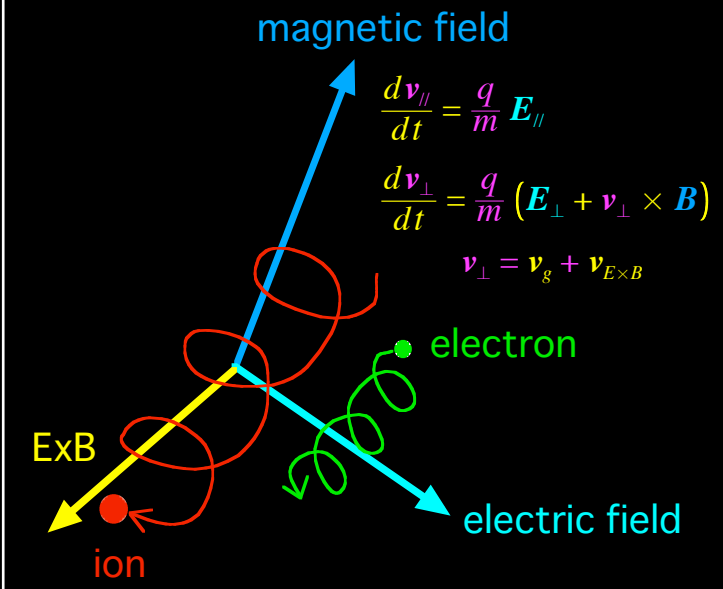
4. Interaction with electric field and magnetic field



$B_\perp$-plane



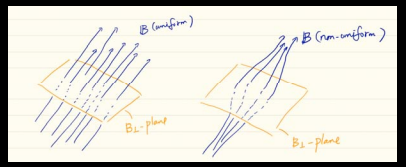
ExB drift of gyration center:

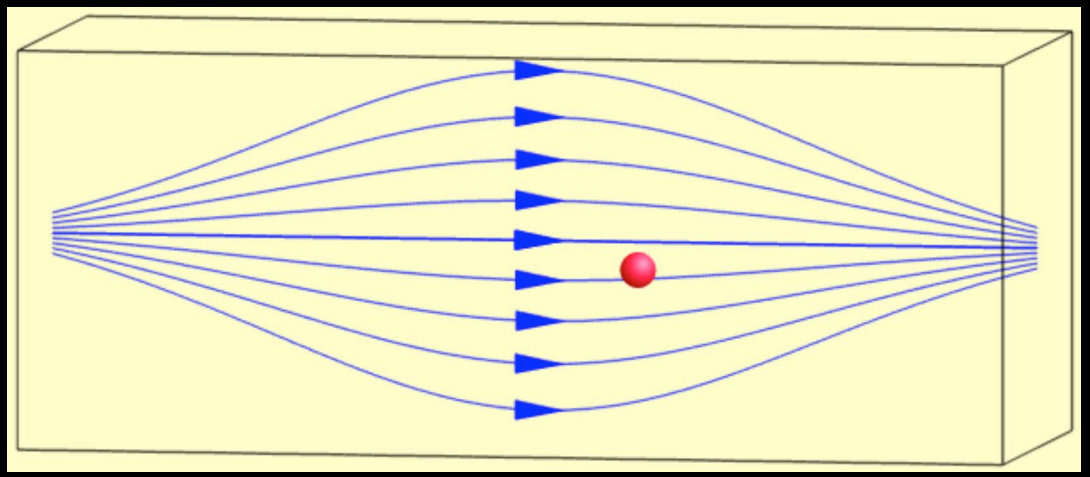
$$v_{E\times B} \equiv \frac{E \times B}{B^2}$$

... perpendicular to both electric field and magnetic field

... does not depend on mass & charge of a particle => keep local charge neutrality

5. Interaction with non-uniform magnetic field





Mirror effect

Relatively low-energy charged particles are reflected at a region where magnetic field becomes strong.

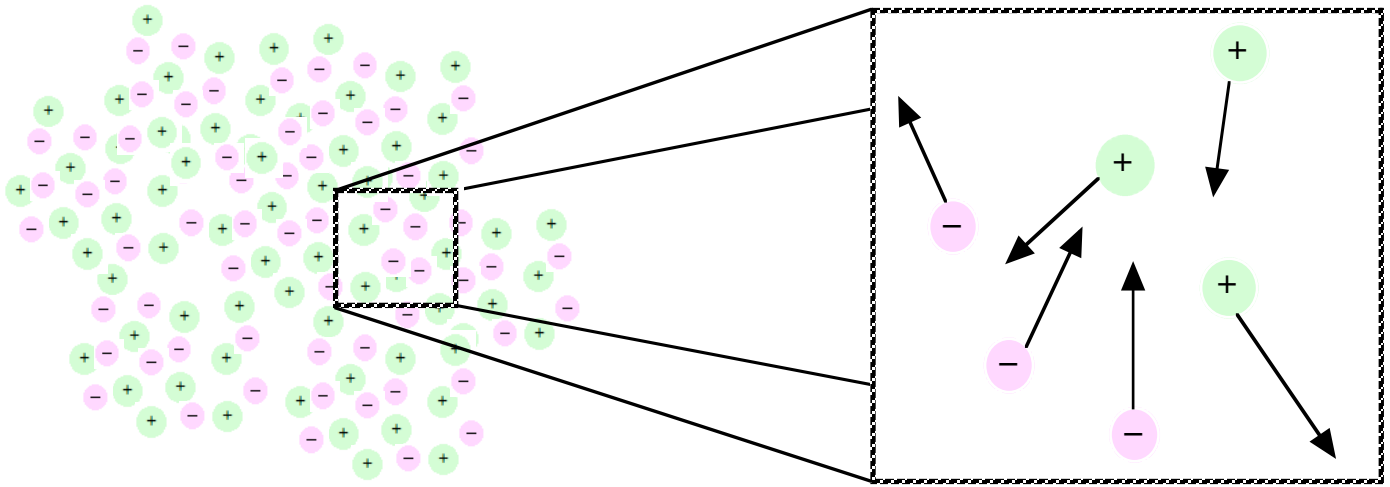
(This may cause particle acceleration when the region moves against an incident particle.)

Two approaches to plasma physics

Plasma... composed of many particles

Focus on a selected local region → Kinetic approach

Focus on the whole region → Fluid approach

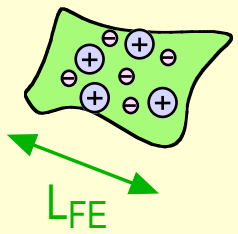


Fluid approach

Kinetic approach

Kinetic approach → study microscale processes,
the behavior of particles

Fluid approach → study macroscale processes,
the behavior of fluid elements*



*fluid element... a virtual object containing a number of particles;
most of the particles keep staying inside this
object (=> typical size $L_{FE} >> l_{mfp}, r_G$)

l_{mfp}: mean free path r_G: gyration radius