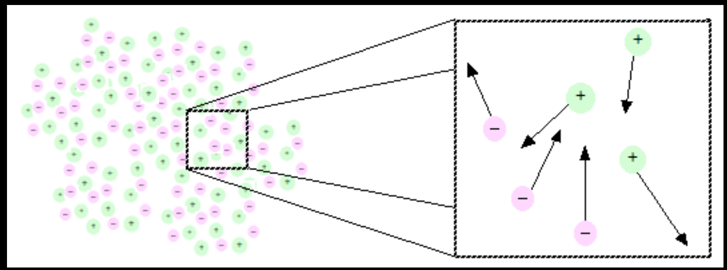
1. Local charge neutrality

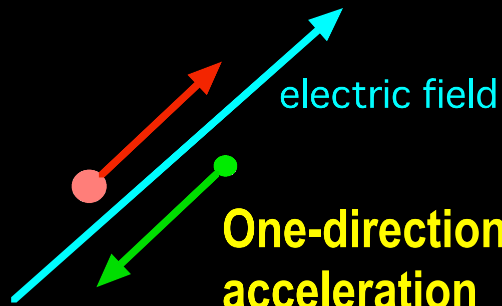


The numbers of positive charges and negative charges are almost the same in every local region.

2. Interaction with electric field (Coulomb force: $F_C = q\,E$)

Red... ion (+)

Green... electron (–)



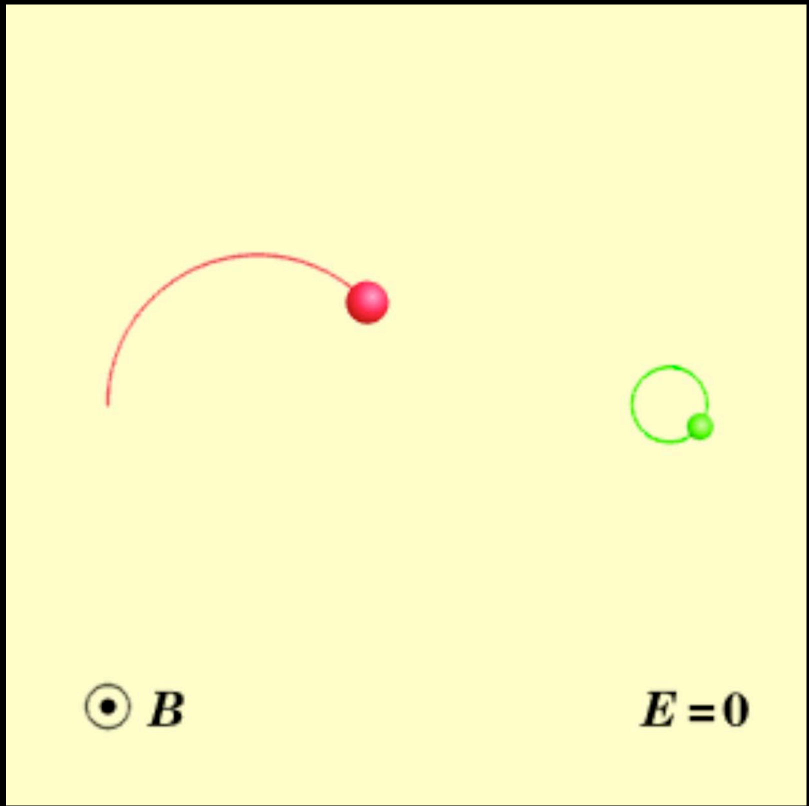
One-directional acceleration

Charged particles are accelerated along electric field.

$$\frac{d\boldsymbol{v}}{dt} = \frac{q}{m}\boldsymbol{E}$$

Magnitude of *v* is changed.

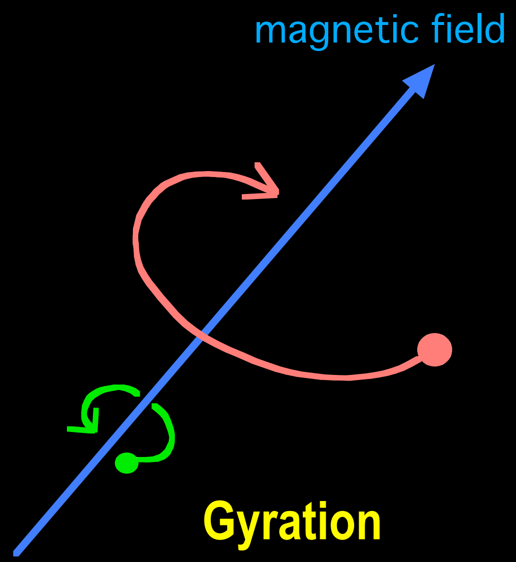
3. Interaction with magnetic field (Lorentz force: $F_L = q\,\boldsymbol{v} \times \boldsymbol{B}$)



$B_\perp$-plane

Red... ion (+)

Green... electron (–)



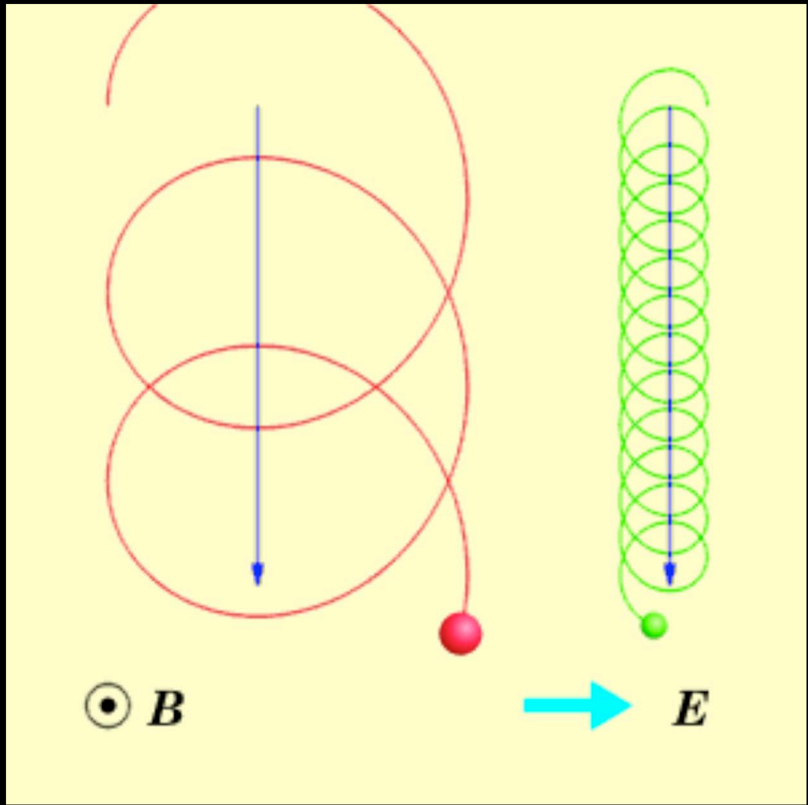
Gyration

Charged particles gyrate around magnetic field.

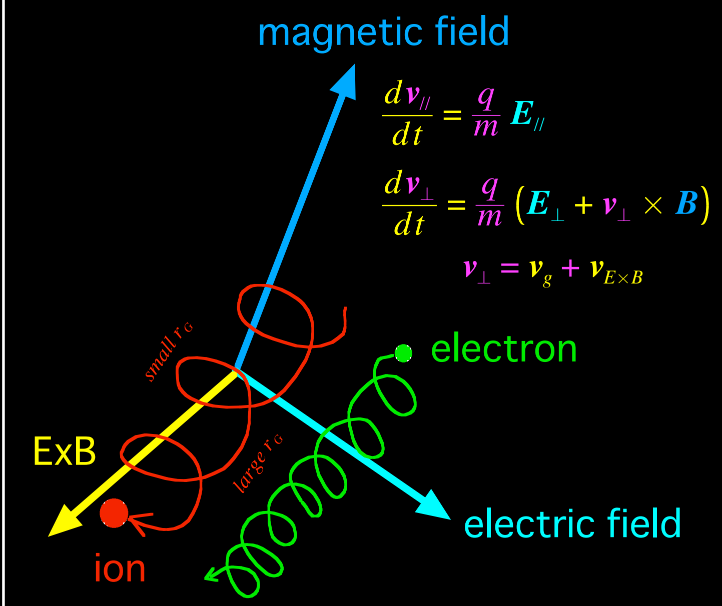
Direction of *v* is changed.

$$\frac{d\boldsymbol{v}_\perp}{dt} = \frac{q}{m}\boldsymbol{v}_\perp \times \boldsymbol{B}$$

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