



FYS 3610

Exercise Week 35 due 04. September 2015

Exercises

Adding a static electric field \vec{E} , the EoM of charged particles in a magnetic field \vec{B}_0 changes to

$$m \frac{d\vec{v}}{dt} = q(\vec{E} + \vec{v} \times \vec{B}_0).$$

and

$$\frac{d\vec{r}}{dt} = \vec{v}$$

Again, use Euler's method to discretize the EoM for a static magnetic field $\vec{B}_0 = (0, 0, B_0)$ and including a static electric field $\vec{E} = (E_x, E_y, 0)$.

Exercise 1: Write a computer program in the language of your choice (preferably python) that numerically solves the EOM for an electron and an oxygen ion (O^+) in a magnetic field of $B_0 = 50\,000$ nT and an electric field of $\vec{E} = (50, 0, 0)$ mV/m. Let the initial velocities of both particles be $\vec{v} = (500, 0, 0)$ m/s. Choose your time step h such that the gyro motion is properly resolved!

Exercise 2: Plot the trajectory for both particles and check the theoretical prediction of the drift velocity.

Exercise 3: How does the trajectory change if you change the initial velocity components v_x and v_y without changing the total velocity?

