Non Loop EMF Experiment

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In order to test EMF creation by Lorentz force, I have proposed an experiment in the article Lorentz' EMF Experiment
http://pengkuanem.blogspot.com/2012/06/lorentz-emf-experiment.html

But, this experiment is difficult to implement because the process of measurement is complicated: put the bar in place, communicate it a speed, remove it, stop, measure the tension. One has to resume this again and again.

Here is a better design that permits continuous measurement of the EMF created by the bar in a non loop setup. This design uses 2 isolated metallic spheres as condensers, which is illustrated in the Figure 1 (a). In this figure a battery charges the 2 spheres that stock electrostatic charge. The quantity of charge is proportional to the potential of the sphere which is:

$$U_+ = \frac{Q}{4\pi\varepsilon_0 r_s}$$

for the positive sphere. The negative sphere has the opposite potential:

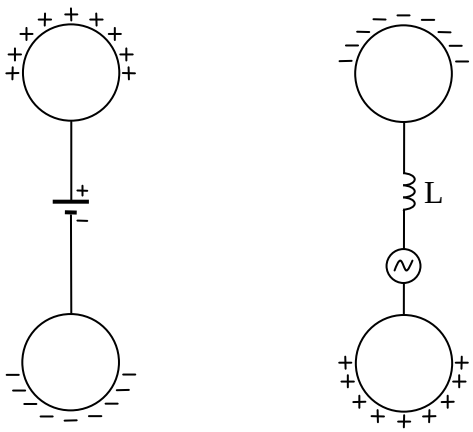
$$U_- = -\frac{Q}{4\pi\varepsilon_0 r_s}$$

The difference of potential of the 2 spheres is:

$$U_+ - U_- = \frac{Q}{2\pi\varepsilon_0 r_s}$$

So, the capacity of the pair of spheres is:

$$C = \frac{Q}{U_+ - U_-} = 2\pi\varepsilon_0 r_s \qquad (1)$$



(a) (b)

Figure 1

If we connect an alternate current generator between the 2 spheres, there will be current flowing in the wire. To measure this current, we connect an inductor that will create a tension between its poles without consuming energy (see the Figure 1 (b)). For our non loop setup, the alternate current generator is the conductor bar moving in a magnetic field ***B***. The bar is connected through flexible wires and moves back and forth to create alternate Lorentz force (see Figure 2 (a)).

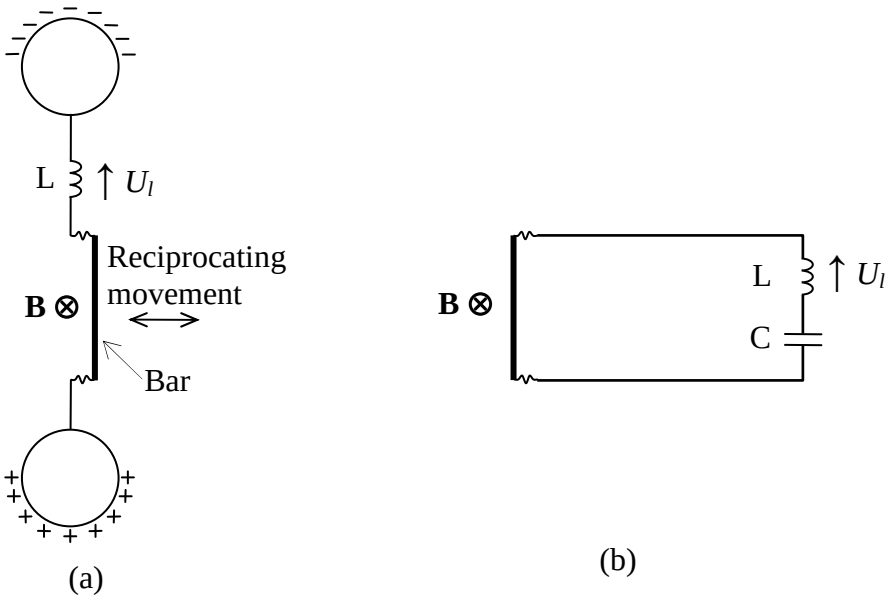


Figure 2

According to classical electromagnetism, the bar will create alternate EMF and makes current flow in the wire and charges alternately the 2 spheres. This current should create a tension around the inductor U_l. But according to my article Lorentz' EMF paradox
http://pengkuanem.blogspot.fr/2012/05/lorentz-emf.html
Lorentz force does not created EMF, and the measured tension U_l should be 0.

As a base of comparison, a closed loop setup with the same bar, inductor and magnetic field will be made (see the Figure 2(b)). A plate condenser is used in place of the pair of sphere and whose capacity equals that of the pair of sphere. The capacity of a plate condenser is:

$$C = \frac{\varepsilon_0 A}{d}$$

For a round plate condenser, the area is: $A = \pi r_p^2$

This condenser has the same capacity as the pair of sphere (see equation (1)):

$$2\pi\varepsilon_0 r_s = \frac{\varepsilon_0 \pi r_p^2}{d} \Rightarrow r_p = \sqrt{2 r_s d}$$

As numerical example, if the spheres have diameter r_s=100 mm, the plate condenser has distance between plates d=0.5 mm, the diameter of the plate condenser will be r_p=10 mm.

The circuit diagram of the closed loop setup is shown in the Figure 3. The impedances are:

$$Z_l = j\omega L,\ Z_c = \frac{1}{j\omega C},\ Z = j\omega L + \frac{1}{j\omega C}$$

The current is:

$$I = \frac{U}{Z}$$

And the tension of the generator is deduced from the measured tension around the inductor U_l:

$$U = U_l \frac{j\omega L + \frac{1}{j\omega C}}{j\omega L} = U_l \left(1 - \frac{1}{\omega^2 LC}\right)$$

Figure 3

The circuit diagram of the non loop setup is also the Figure 3 with the same capacity and inductance. We will measure the tension around the inductor and deduce that of the bar which is the generator. The expected result is that the tension of the closed loop conforms Faraday's law and that of the non loop setup is 0.