VI. Railgun

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Abstract—In this experiment the student will create a simple railgun, thus observe the Lorentz force. The railgun is a device that allows an object to be accelerated due to the magnetic force exerted by a magnetic field on a wire transporting current. The wire will also work as an axle, and the magnetic field will be created by round magnets used as wheels for the railgun.

I. INTRODUCTION

In this final lab, the student is challenged to assemble the device and make the appropriate lab report, matching the usual requirements. Instructions on how to assemble the railgun are provided.

II. PROCEDURE

A. Material
1) Cardboard
2) Aluminium foil
3) Conducting wire (hard enough to provide support for the axle)
4) 2 disc magnets, plated in a good conductor
5) Glue
6) 9 volt battery
7) Two alligator clip leads
8) Scissors, snappers, and a filer

B. Assembly
1) Cut down two strips of aluminium foil, about two inches thick. Spread a thin layer of glue in the foil, and paste in the cardboard, separated by about 1/2 inch. Remove as many wrinkles as possible. These are the rails.
2) Connect each pole of the battery to a rail.
3) Cut the axle from the wire, as straight as possible. Beware of matching the length to allow the wheels to stand on the middle of the rail.
4) File the wire so the magnets are allowed to rest flat on the axle.
5) Place the magnets (wheels), they should have the poles in opposite directions. (Don’t glue them, it won’t work and will only make a mess, it might ruin the coating)
6) Drop the axle in the rails and it should move, if not, the magnets might be misplaced. If it moves in the opposite direction, try changing the polarity of the battery (or toss from the other end of the rail).

III. MEASUREMENTS

Measure the acceleration and estimate the field strength. Compare to the manufacturer’s surface magnetic field strength. Estimate a function for distance between magnets (axle), by creating different axles.

In your report you are expected to explain how it is working. There is plenty of information and some interesting applications, include some.

REFERENCES