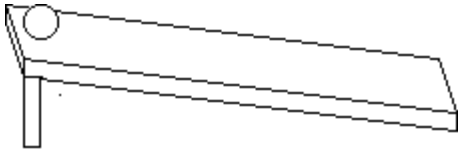
Magnetic Guide Rail

Keeping Centered



Introduction

Eddy currents will keep a rolling magnet centered as it rolls on an aluminum rail.

Material

A flat topped slab of aluminum, at least 25 cm long, at least 4 cm wide and as thick as possible. (Copper works even better.)

A disk shaped neodymium magnet, at least 0.5 cm thick and 1 cm in diameter.

A nonmagnetic spacer to hold up one end of the aluminum.

To Do and Notice

Lift one end of the aluminum about 2 cm higher than the other.

Roll the disk magnet down the aluminum track.
Notice that it keeps itself centered.
Even if it rolls toward one edge it will steer back toward the center of the rail.

What's Going On?

When a magnet moves near a conductor it creates eddy currents in the conductor.
These eddy currents make magnetic fields that push on, and oppose the motion of, the moving magnet.

If the magnet is rolling near the edge of the conductor then eddy currents will be greater on the side of the magnet nearest the center of the rail. The larger drag force on the side of the magnet nearer the center of the rail will steer the magnet back toward the center of the track.

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