Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Propulsion and Levitation with a Large Electrodynamic Wheel
NATHAN GAUL, HANNAH LANE, Northern Virginia Community College, Annandale, VA — We constructed an electrodynamic wheel using a motorized bicycle wheel with a radius of 12 inches and 36 one-inch cube magnets attached to the rim of the wheel. The radial magnetic field on the outside of the wheel was maximized by arranging the magnets into a series of Halbach arrays which amplify the field on one side of the array and reduce it on the other side. Rotating the wheel produces a rapidly oscillating magnetic field. When a conductive metal "track" is placed in this area of strong magnetic flux, eddy currents are produced in the track. These eddy currents create magnetic fields that interact with the magnetic fields from the electrodynamic wheel. The interaction of the magnetic fields produces lift and drag forces on the track which were measured with force gauges. Measurements were taken at a variety of wheel speeds, and the results were compared to the theoretical prediction that there should be a linear relationship between the lift and drag forces with increasing wheel speed. Partial levitation was achieved with the current electrodynamic wheel. In the future, the wheel will be upgraded to include 72 magnets rather than 36 magnets. This will double the frequency at which the magnetic field oscillates, increasing the magnetic flux. Electrodynamic wheels have applications to the transportation industry, since multiple electrodynamic wheels could be used on a vehicle to produce a lift and propulsion force over a conductive track.

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Date submitted: 06 Dec 2015 Electronic form version 1.4