

A Motional Electromotive Force Experiment for the Introductory Physics Laboratory

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Outline

Motivation

Description of the Experiment

Equipment

Measurements

Results

Student Response

Conclusion

Motivation

Few experiments have been available in EMI

This experiment is conceptually simple

The experimental procedure is brief

The equipment is easily accessible

The results are convincing to students

Description of the Experiment

One end of a coil is swept through a magnetic field. The speed of the coil, the magnetic field and the induced voltage are measured. The measured induced voltage is compared to the value predicted from

$$V = N v B W$$

where V is the induced voltage, N is the number of coil turns, v is the coil velocity, B is the average magnetic field and W is the width of the coil.

Equipment

Pentium Computer

Pasco 750 Computer Interface

Pasco Motion Sensor

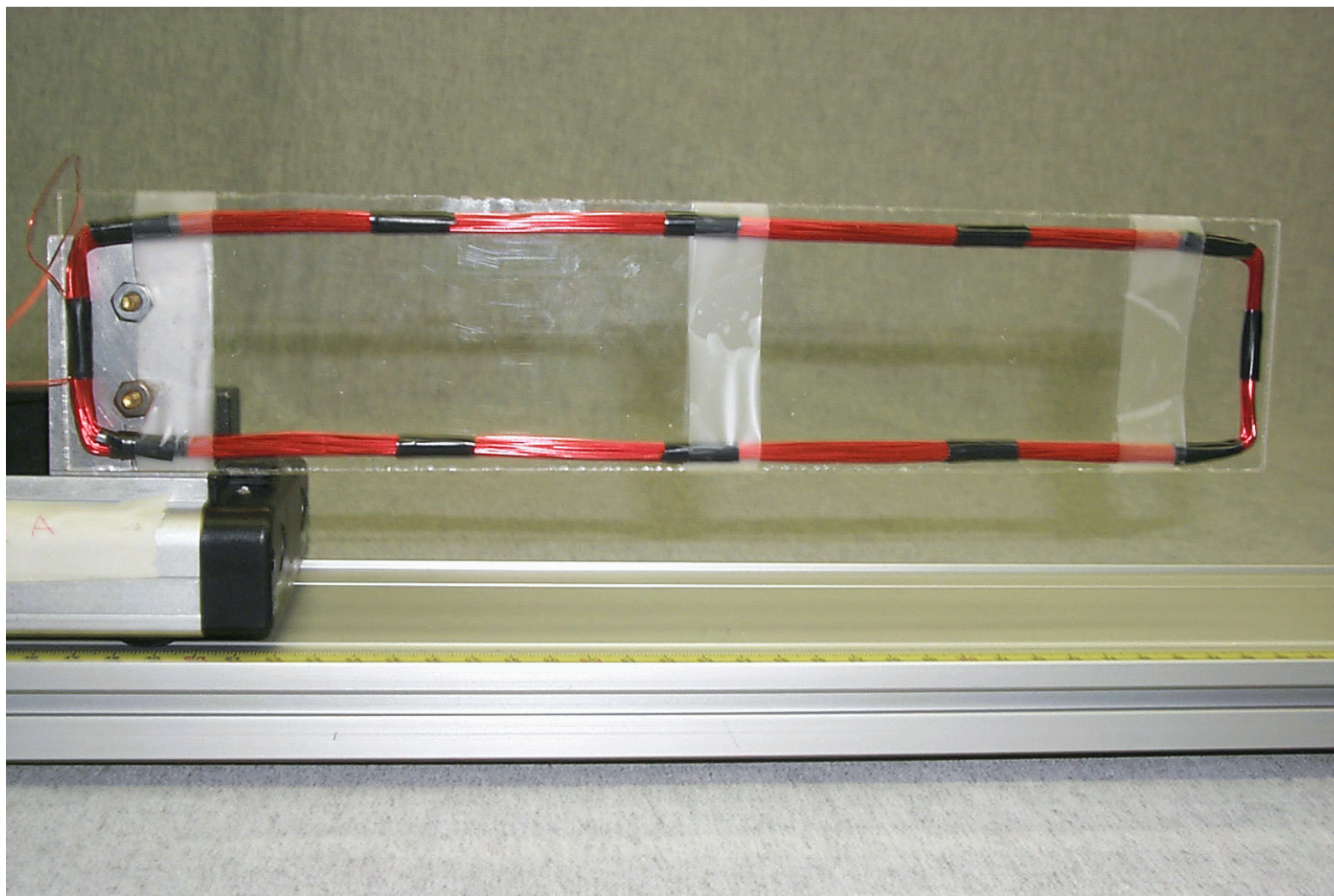
Pasco Cart and Track

Coil of 50 loops

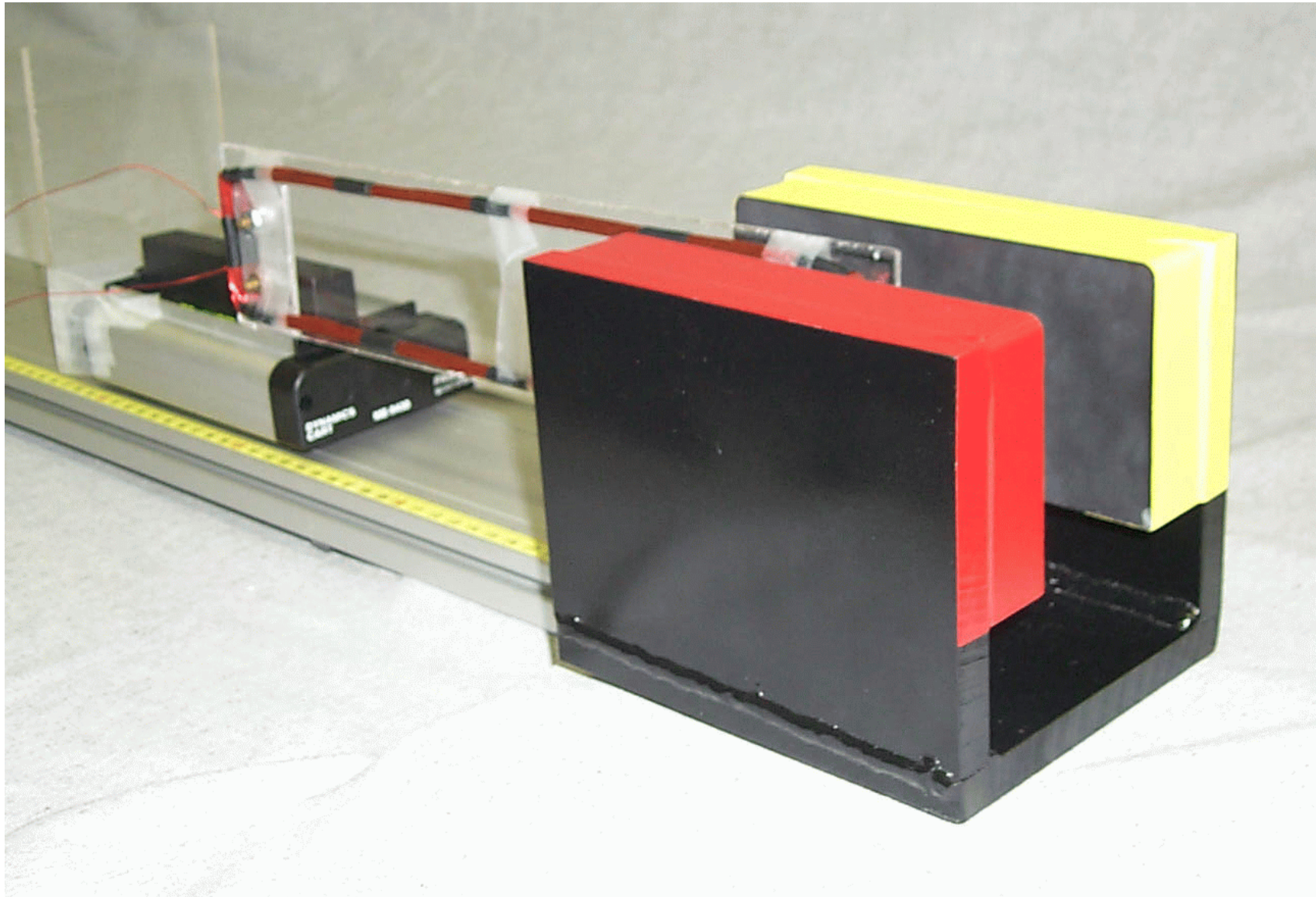
Magnet

F.W. Bell 4048 Hall Element Gauss Meter

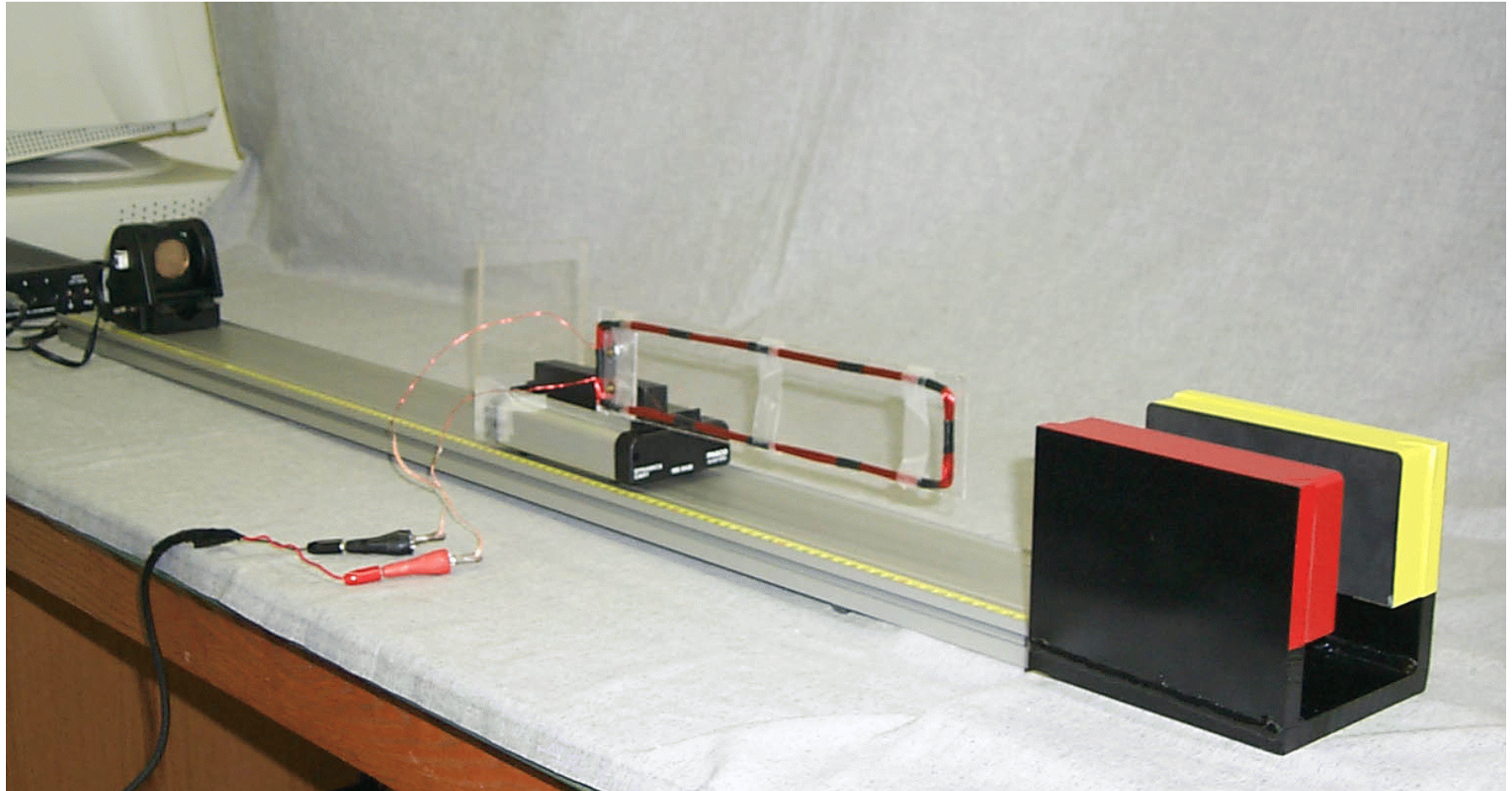
Coil



Magnet



Experimental Setup



Measurements

coil velocity - determined from average of values given by the motion sensor as the coil moves through the central region of the magnet

magnetic field - determined from average of values measured by the Bell Hall Element Gauss Meter at the center of the magnet at points along the coil width

coil width - measured from the middle of the top section to the middle of the bottom section of the coil

