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Simple activities using student smartphone magnetometers for electrical measurements

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This presentation describes different ways a smartphone's onboard magnetometer can be combined with a simple student-constructed coil of wire and used to explore relationships between electricity and magnetism. The measurement of electrical phenomena such as DC current and voltage will be discussed.

For several years students and teachers have had access to software that enables the use of smartphones as experimental tools, or SETs, by providing access to the output of sensors common to most smartphones such as accelerometers, light sensors and microphones. A significant amount of attention has been paid by the academic community to the effectiveness of this approach and many different student activities have been developed that allow more traditional (and expensive) teaching equipment to be supplemented by and perhaps even replaced by student smartphones equipped with free software.

A smartphone's ability to measure electrical signals directly is usually limited to the use of an earphone jack, and the risk of damage to the smartphone posed by this approach makes it unattractive to teachers. As a result, the area of secondary- and undergraduate-level physics education least addressed by existing SETs-related resources is electricity.

Almost all smartphones include a magnetometer based on multiple Hall Effect sensors, and this presents a relatively risk-free way to infer electrical current from the magnetic field created by a simple coil, for example. This presentation will review the small number of publications that examine this idea, describe experimental results obtained using different smartphones and different coil designs, and provide example activities a teacher may attempt using this approach.

Keyword-1

Smartphone

Keyword-2

Magnetometer

Keyword-3

Electricity

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