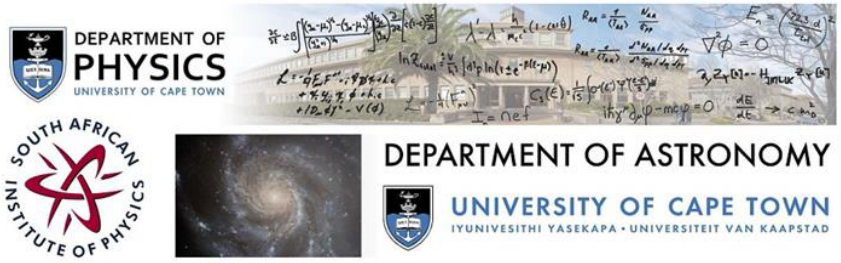

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Efficiency measurement system for thermoelectric devices

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Abstract content
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A fraction of the energy used to supply mechanical, electronic and electric devices is lost in the form of mechanical and heat energy. The efficiency of a general device is defined as a ratio of the energy used for the purpose for which the device was designed and the total power supplied to the device. The new devices are designed to reduce the energy loss, but it is not possible to consider all the environmental variables that act against the system. The electronic devices, e.g. the radio transmitter or engines, loose energy in the form of heat and this reduces the efficiency.

To mitigate the energy loss it is possible to exploit the Seebeck effect which is a thermoelectric phenomenon that occurs when the two junction of two different conductors have two different temperature. When the difference of temperature increase a current flows through the conductors, and this current can be suitable to supply the energy for other electronic devices. The process is reversible, if the current flows into the conductors where a difference of temperature is present between the two junctions. The aforementioned effect is used to cool down the temperature of the microprocessors or for general refrigeration purposes.

In this research we intend to design an energy harvesting device using commercial thermocouples. An efficiency measurement system is presented. The thermocouple is located in a box where it is possible to create two different temperatures between the first junction and the second junction. A numerical algorithm combined with an electronic system is capable to measure the supplied energy, the energy lost in the measurement box and the energy produced by the thermocouple. In this way it is possible to calculate the efficiency for different temperatures and study a way to obtain a well designed system for energy harvesting.

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