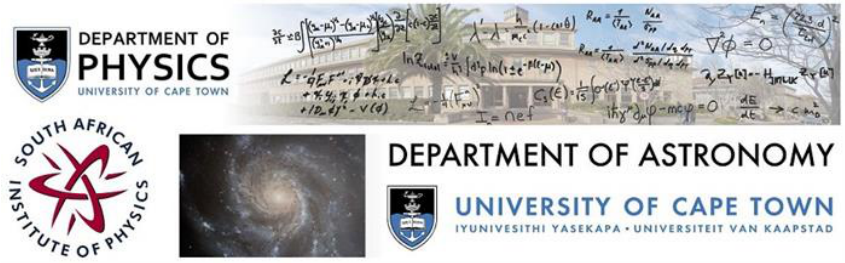

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The re-definition of the of mass

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Abstract content
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Worldwide, all mass measurements done according to the International System of Units (SI) are traceable the International Prototype Kilogram (IPK). The IPK is defined as the mass of a Pt-Ir alloy cylinder that is kept as the International Bureau of Weights and Measures (BIPM) in Paris, France. The international definition of the kilogram in the SI has not changed since 1889.

Although the IPK was "fit-for-purpose" in the late 19th century, it is not sufficient for the 21st century. One of the challenges is a slight change in the mass of the IPK and/ or the six reference copies of the IPK to the order of 50 µg over a 100 year period. Although it is kept in a safe, the risk of theft does exist. In metrology and the defining of SI, the trend is to move away from artefacts towards realising the SI through physical constants. Mass is the only SI still defined through a physical object, the IPK.

In order to redefine mass, two experiments are currently under investigation, namely the Avogadro constant and the Planck constant projects. Before the final decision on the re-definition both projects are investigated in detail. The Avogadro constant project links the kilogram unit to the Avogadro constant, NA, (6,022 140 76 × 1023 mol−1) using a single-crystal Si sphere. In 2015 the link was established to an accuracy of 2 x 10-8. In the Planck's constant, h, experiment (using a Watt balance) the weight of a test object is measured by measuring the strength of an electric current and a voltage. An accuracy of 1,8 x 10-8 was achieved for the value of h with a Watt balance.

This paper will discuss NMISA's Watt balance project to position South Africa for this redefinition that is planned for 2018.

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