

# Redefining the kilogram at NPL

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NPL's design for the next-generation of Kibble balances. Credit: National

Researchers from the National Physical Laboratory (NPL) are working with scientists across the globe to redefine the SI unit of mass, the kilogram, as part of a major revision of the SI base units. NPL has recently published a short document describing the redefinition, including details of the two key experiments being developed internationally and outlining the impact the redefinition has for end users.

Of the seven SI base units, the kilogram is the only unit that is still defined by a physical artefact, the International Prototype Kilogram (IPK). Under the present system, all standards of mass must ultimately be traceable to the IPK. However, as the need for accurate measurements in science and industry increases, the search has been under way for a definition of the kilogram in terms of a fundamental constant which offers the guarantee of long-term stability unachievable with an artefact based definition.

The revision of the SI, including the kilogram redefinition, is planned for 2018. From this date onwards, the definition of mass will be in terms of a fixed numerical value of the Planck constant ( $h$ ). Those in the [mass](#) community can then, theoretically, realise the kilogram, with relation to the Planck constant, using any suitable experiment. Currently, there are two experiments operating at the level of uncertainty required for a primary realisation (2 parts in  $10^8$ ), the Kibble balance (formerly known as the watt balance) and the Avogadro experiment. The Kibble balance method of realising the kilogram does so by comparing measurements of electrical and mechanical power and realising the kilogram in terms of quantum electrical standards. The Avogadro experiment will realise the [kilogram](#) via the Avogadro constant ( $N_A$ ), by determining the number of

atoms in a silicon sphere.

**More information:** Find out more about the Kibble balance experiment: [www.npl.co.uk/science-technology/npl-kibble-balance](http://www.npl.co.uk/science-technology/npl-kibble-balance)

Find out more about the Avogadro experiments: [www.npl.co.uk/science-technology/rch/avogadro-project](http://www.npl.co.uk/science-technology/rch/avogadro-project)

Download the "Impact of the Redefinition of the Kilogram" document: [www.npl.co.uk/content/ConMediaFile/10581](http://www.npl.co.uk/content/ConMediaFile/10581)

Provided by National Physical Laboratory

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