

Final Version
Recommendation U1 (2005)

On possible changes to the definitions of the kilogram, the ampere, the kelvin and the mole

The CCU,

considering

- the responsibilities of the CCU, namely:
those given to it at its creation in 1964 by the CIPM concerning the development of the SI,
its responsibility for the drawing up of successive editions of the SI brochure,
the further responsibility of giving advice to the CIPM on matters related to units of measurement;
- the importance of taking a broad and profound view of the SI to ensure that it meets the needs of all users while at the same time ensuring that it reflects advances in science and in the understanding of the structure of physics;
- the great improvements that have taken place in the accuracy of our knowledge of the values of most of the fundamental constants of physics since the last change in the definition of a base unit in 1983, which fixed the value of the speed of light in vacuum;
- the impact on metrology of the application of the Josephson and quantum-Hall effects;
- the consensus that now exists on the desirability of finding ways of defining all of the base units of the SI in terms of fundamental physical constants so that they are universal, permanent and invariant in time;
- Resolution 7 of the 21st CGPM, 1999, concerning a future definition of the kilogram;
- the recent (2005) recommendations from the CCM, the CCEM, and the CCT to the CIPM concerning possible redefinitions of the kilogram to fix, for example, the Planck constant, the ampere to fix the elementary charge and the kelvin to fix the Boltzmann constant, and also from the CCQM in relation to the interests of the chemical community;
- the recent recommendation to the CCU from the CODATA Task Group on Fundamental Constants supporting the redefinitions above, and also on redefining at the same time the mole in terms of a fixed value of the Avogadro constant;
- the broad view that has emerged from discussions at these meetings of Consultative Committees and the CODATA Task Group, that if changes do take place in the definitions of the kilogram, the ampere and the kelvin, they should all take place at the same time;

- that further experimental results are essential, as noted by the Consultative Committees in their Recommendations cited above, before redefinition of the base units could be implemented;
- that before such important changes are made to the definitions of base units of the SI, wide publicity must be given to the draft proposals so that the opinion of the broad scientific and other user communities, not directly touched by the Consultative Committee structure of the Metre Convention, can be obtained and taken into account;

requests that

- the CIPM approve in principle the preparation of new definitions and *mise-en-pratiques* of the kilogram, the ampere and the kelvin so that if the results of experimental measurements are indeed acceptable, all having been agreed with the various Consultative Committees and other relevant bodies, the CIPM can prepare proposals to be put to Member Governments of the Metre Convention in time for possible adoption by the 24th CGPM in 2011;
- the CIPM give consideration to the possibility of redefining, at the same time, the mole in terms of a fixed value of the Avogadro constant;
- the CIPM prepare a Resolution that may be put to the 23rd CGPM in 2007 to alert member states to these activities;
- the CIPM further encourage NMIs to pursue national funding to support continued relevant research in order to facilitate the changes suggested above and improve our knowledge of the relevant fundamental constants, with a view to further improvement in the International System of Units.