RECOMMENDATION OF THE CONSULTATIVE COMMITTEE FOR UNITS TO BE SUBMITTED TO THE INTERNATIONAL COMMITTEE FOR WEIGHTS AND MEASURES

RECOMMENDATION U1 (2017)

On the possible redefinition of the kilogram, ampere, kelvin and mole in 2018

The Consultative Committee for Units (CCU), at its 23rd meeting in 2017,

recalling

- Resolution 1 of the 24th General Conference on Weights and Measures (CGPM) in 2011 "*On the possible future revision of the International System of Units, the SI*", which took note of the intention of the International Committee for Weights and Measures (CIPM) to propose a revision of the SI that would link the definitions of the kilogram, ampere, kelvin and mole to exact numerical values of the Planck constant *h*, elementary charge *e*, Boltzmann constant *k* and Avogadro constant N_A,

- Resolution 1 of the 25th CGPM in 2014 "*On the future revision of the International System of Units, the SI*", which noted that despite significant progress the data did not appear to be sufficiently robust for the CGPM to adopt the revised SI at its 25th meeting and therefore encouraged National Metrology Institutes (NMIs) and the International Bureau of Weights and Measures (BIPM) to pursue efforts to obtain data relevant to the determination of *h*, *e*, *k*, and N_A with the requisite uncertainties,

- the request by the President of the CIPM to review and summarize the current status of the experimental values for the Planck constant,

acknowledging

- that the NMIs as well as the BIPM have expended significant efforts during the past several decades in work pursuing the revision of the SI in terms of defining constants,

- that since 2014 significant advances have been made in relating the mass of the International Prototype of the Kilogram to the Planck constant by the Kibble balance and the X-Ray Crystal Density (XRCD) methods,

- that significant advances have been made in relating the kelvin to the Boltzmann constant,

considering

- the general agreement on the importance, value and expected benefits of a revision of the SI based on a redefinition of the kilogram, ampere, kelvin and mole in terms of defining constants,
- that the revised SI will provide world-wide harmonization and long-term stability for the realization of these units,
- recommendation G1 (2017) from the Consultative Committee for Mass and Related Quantities (CCM) and recommendation T1 (2017) from the Consultative Committee for Thermometry (CCT) each of which recommends that the CIPM should undertake the necessary steps to proceed with the planned redefinition of the SI at the 26th CGPM,
- that work on the preparation of the *mises-en-pratique* for the new definitions of the kilogram, ampere, kelvin and mole is close to completion,
- that work on the preparation of the 9th edition of the SI Brochure, which will present the revised SI, is also close to completion,

notes

- that work is under way in NMIs to understand the cause for the dispersion of the experimental determinations of the Planck and Avogadro constants,
- that the number of NMIs involved in the development of a primary realization of the redefined kilogram and kelvin has been increasing, and that new efforts are expected,

concludes

- that numerical values and uncertainties for the Planck constant, the elementary charge, the Boltzmann constant and the Avogadro constant provided by the CODATA Task Group on Fundamental Constants in their special Least-Squares Adjustment of the experimental data provide a sufficient foundation to support the redefinition,

recommends

- that the CIPM undertakes the necessary steps to proceed with the planned redefinition of the kilogram, ampere, kelvin and mole at the 26th CGPM in 2018.