PHYSIKALISCHES KOLLOQUIUM

AM 13. JULI 2015 UM 17 UHR C.T.

IM GROßEN HÖRSAAL

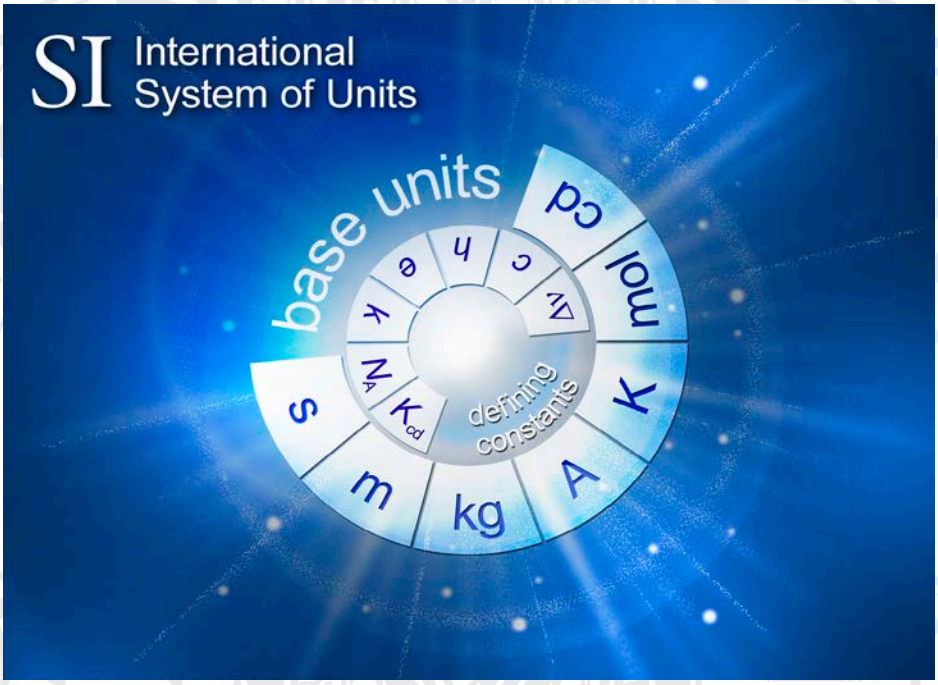

Figure: Logo of the New SI with the defining constants and the seven base units.

PHYSICAL UNITS BASED ON FUNDAMENTAL CONSTANTS – CHANGING WITH TIME?

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In 2018, on the occasion of the 25th meeting of the General Conference on Weights and Measures, CGPM, of the Metre Convention founded in 1875, it is envisaged to redefine the International System of Units (SI). In the future, as outlined by Max-Planck in his famous paper of 1900 postulating the "Planck constant", it shall be based on fundamental constants of nature, the "defining constants": the velocity of light, the charge of the electron, the Boltzmann, Avogadro and the Planck constants, the Cs hyperfine clock transition and the luminous efficacy.
In the talk I will provide an overview on the progress, challenges and future perspectives of the new "Quantum SI", illustrated in Fig. 1, and discuss the question on whether or not the fundamental constants are indeed constant in time. New experiments are presently being devised, one of them based on next-generation optical clocks using transitions in highly charged ions that are read out via quantum-logic schemes. They bear the potential to trace potential changes in the fine structure constant α on the level of $\Delta\alpha/\alpha \approx 10^{-20}$ per year.