

Seminar: Hard Condensed Matter Theory

Room: Media room 03-431 (Staudinger Weg 7)

Time: June 7th, 2016 at 14:00

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Single electron pumps: from primary current standards to single spin on demand

In 2018 the General Conference on Weights and Measures is planning to revise the International System of Units (the SI). In the "New SI" four of the SI base units, the kilogram, the ampere, the kelvin and the mole, will be redefined in terms of fixed values of four natural constants, namely the Planck constant, the elementary charge e , the Boltzmann constant, and the Avogadro constant. A direct primary representation of the ampere in the new SI could be realized using a so-called single electron pump. Such single electron pump is based on single electron transistor driven by an oscillating voltage with frequency f . During one oscillation cycle one electron is first captured from source and later ejected to drain thereby generating a quantized current $I = ef$. In my talk I will review the present state of the development of single electron pumps for the future representation of the ampere. I will show that semiconductor-based non-adiabatic single electron pumps are promising candidates for a primary representation of the ampere as they allow reaching relatively high currents in combination with quantization accuracy precision. I will further discuss the aspect measurement of error events based on single charge detection. Further I will give a short outlook on further prospects of single electron pumps like shot noise free current sources or as sources of single spins on demand.

All interested are cordially welcome!