ÉCOLE DE PHYSIQUE des HOUCHES

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Compact optical clock with trapped charged particles

The purpose of this work is to design and realize an optical atomic clock based on the 435,5nm quadrupole transition of the 171Yb+. The study aims at obtaining a frequency stability of 10-14 at one second of integration time in a complete setup volume of less than 100 liter.
To achieve this performance, the Ytterbium ions will be laser-cooled and trapped by electrodynamics fields. In order to satisfy the volume constraints we will design a micro-fabricated surface-electrode (SE) trap and a reduced vacuum chamber for the charged particles. We will also use fibered optical components whenever possible.
SE traps are usually used in quantum information processing setups. The use of such a device in a metrological experiment should also allow the fine characterization of the trap characteristics, such as heating rates and coherence times.

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