ID de Contribution: **27** Type: **Invited talk**

Element No. 12: Benefits and challenges of Mg in frequency metrology

lundi 22 février 2016 12:00 (30 minutes)

Among the alkaline earth(-like) elements, magnesium is considered to be an ideal candidate for optical lattice clocks: it features a very large transition Q-factor [1] and a naturally low sensitivity to blackbody radiation at the same time [2]. Moreover, as a consequence of its low mass and simple atomic structure, atomic models can be implemented with higher precision in Mg, than for Sr or Yb [3]. However, these advantages come at the expense of experimental challenges for creating ultra-cold atomic ensembles.

In this talk, we will give an overview of past and on-going works for applications in frequency metrology. We will consider the relevant level scheme of bosonic ^{24}Mg and highlight the technical challenges concerning laser cooling and trapping. Finally, we summarize the requirements to demonstrate an optical lattice clock with ^{24}Mg at 10^{-18} uncertainty.

Recently, we demonstrated the trapping of cold magnesium atoms in a magic-wavelength optical lattice and observed the strongly forbidden $^1S_0 - ^3P_0$ clock transition in bosonic ^{24}Mg. We determined the magic wavelength of 468.46(21) nm and observed a magnetic polarizability of -206(2) MHz/T^2 [4].

References:

[1] A. Taichenachev et al. , *Phys. Rev. Lett.* **96**, 083001 (2006)
[2] S. Porsev and A. Derevianko, *Phys. Rev. A* **74**, 020502 (2006)
[3] J. Mitroy et al., *J. Phys. B* **43**, 202001 (2010)
[4] A. P. Kulosa et al., *Phys. Rev. Lett.* **115**, 240801 (2015)

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