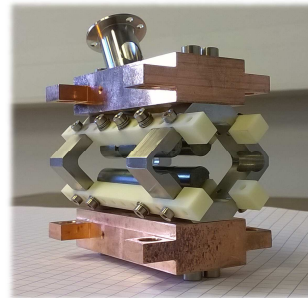


Post Doc Position at LKB - Laboratoire Kastler Brossel Pierre et Marie Curie University, Paris France

« **Trapped ions** » team

<http://www.lkb.upmc.fr/iontrap/>

Precision measurements with cold trapped H_2^+ molecular ions



Research project

The *Trapped Ions* team is developing an experimental setup aiming at performing a direct optical determination of the proton to electron mass ratio at the 0.01 ppb level through Doppler free two-photon vibrational spectroscopy in H_2^+ molecular ions. Spectroscopy will be performed by Resonance Enhanced Multiphoton Ionisation (2+1 **REMPD**) on state selected ions [1,2,3,4].

The H_2^+ ions are confined in a **linear Paul trap** and **sympathetically cooled** by laser cooled **Be⁺** ions. The H_2^+ ions are created by Resonance Enhanced Multiphoton Ionisation (**REMPI**) at 303 nm. The H_2^+ spectroscopy laser is an ultrastable quantum cascade laser (**QCL**) phase-locked on a CO₂ laser matched to a Fabry-Perot cavity surrounding the ion cloud.

The work of the post doctoral scientist will first consist in characterising the temperature and the ro-vibrational populations of the state selected H_2^+ ion sample. It will then consist in achieving the first observation of the $(v=0, L=2) \rightarrow (v=1, L=2)$ two-photon transition in H_2^+ towards a m_p/m_e determination by comparison with highly accurate calculations.

- [1] Jean-Philippe Karr, Franck Bielsa, Albane Douillet, Jofre Pedregosa, Vladimir I. Korobov, Laurent Hilico, Phys. Rev. A **77**, 063410 (2008). *Vibrational spectroscopy of H_2^+ : Hyperfine structure of two-photon transitions.*
- [2] Jean-Philippe Karr, Albane Douillet, Laurent Hilico, Applied Physics B **107**, 1043-1052 (2012). DOI 10.1007/s00340-011-4757-z (2011). *Photodissociation of trapped H_2^+ for REMPD spectroscopy.*
- [3] Biesheuvel, J.-Ph. Karr, L. Hilico, K.S.E. Eikema, W. Ubachs, J.C.J. Koelemeij, Nature Communications **7**, 10385 (2016). *Probing QED and fundamental constants through laser spectroscopy of vibrational transitions in HD^+*
- [4] V.I. Korobov, J.C.J. Koelemeij, L. Hilico, J.-Ph. Karr, Phys. Rev. Lett. **116**, 053003 (2016). *Theoretical Hyperfine Structure of the Molecular Hydrogen Ion at the 1 ppm Level*

Profile

The applicant should have a strong background in experimental physics, in the fields of molecular, atomic, ion and laser physics. An experience in the field of cold matter is desirable.

Starting date

Before mars 2017

The position is funded for one year by the French Research Agency (ANR) and can be extended to a second year.

Application Candidate should provide a CV, motivation letter and publication list and obtain two reference letters directly sent to hilico@spectro.jussieu.fr

Contacts

Laurent Hilico

Tel : +33 1 44 27 60 79 Email : hilico@spectro.jussieu.fr

Jean-Philippe Karr

Tel : +33 1 44 27 60 79 Email : karr@spectro.jussieu.fr

Albane Douillet

Tel : +33 1 44 27 72 48 Email : douillet@spectro.jussieu.fr