

Postdoc position

Kastler Brossel Laboratory, Paris
Trapped ion group

Measuring a Doppler free two-photon transition in H_2^+ for electron to proton mass ratio metrology

The electron to proton mass ratio m_e/m_p is a fundamental constant known today with a relative uncertainty of $4.3 \cdot 10^{-11}$ from unique and independent measurements of m_e and m_p in Penning trap. Direct optical determination of this constant can be done by spectroscopy of the H_2^+ molecular ion because the vibration frequency of the nuclei of this ion depends essentially on m_e/m_p . Recent theoretical advances in the calculation of H_2^+ transition frequencies, including relativistic, radiative and hyperfine structure corrections together with the development of a dedicated Doppler-free two-photon spectroscopy experiment on state selected trapped and sympathetically cooled H_2^+ ions, should improve the uncertainty on m_e/m_p by a factor of 3 - and even 6 in the long term. Comparison with similar measurements made on the HD^+ ion in Düsseldorf and Amsterdam will not only improve the knowledge of m_e/m_p , but also provide a "molecular" determination of the Rydberg constant and the charge radius of the proton, providing new insights into the proton size puzzle.

Contacts: send your application to
Laurent Hilico, laurent.hilico@lkb.upmc.fr,
Jean-Philippe Karr, jean-philippe.karr@lkb.upmc.fr

Starting date: September 1st – December 31th, 2019