Laboratoire de Physique Théorique et Hautes Energies

Unité Mixte de Recherche (UMR 7589) de Sorbonne Université et du CNRS

SEMINAIRE du LPTHE

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Precision theory for hydrogen molecular ions

At present theoretical prediction for the spin-averaged frequency of ro-vibrational transitions in the hydrogen molecular ions (HMI) has reached a relative precision of $\sim 7.5 \times 10^{-12}$*. On the other hand, recent experiment on pure rotational transition in* HD^+ *has demonstrated the power of the Lamb-Dicke regime for precision spectroscopy of the HMI with strong potentiality in the nearest future to achieve a ppt level of spectroscopic accuracy.*

The Rydberg constant as it is determined in the CODATA14 adjustment of the fundamental constants has the relative uncertainty 5.9×10^{-12}*. At the same time the two new experiments on spectroscopy of hydrogen atom performed at LKB, Paris, and MPQ, Munich, disagree in measuring the Rydberg constant by more than* 3σ *!*

In our presentation we want to outline the way how the high precision results for the hydrogen molecular ions may be achieved with the help of the effective field theory — the Nonrelativistic QED. At the very end of our talk we intend to discuss the problems, which are to be solved in order to improve (at least threefold) theoretical predictions. That will bring our theory to the level of accuracy which is better than for the present CODATA14 value of the Rydberg constant. And, we hope, that this will help to resolve the discrepancy between the LKB and MPQ experiments as well as to find answers to many other questions related to the fundamental constants.

Bibliothèque du LPTHE, tour 13/14, 4ème étage

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