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**1S-3S hydrogen spectroscopy with cw laser**[1]

FRANCOIS NEZ, Laboratoire Kastler Brossel/CNRS

High resolution spectroscopy of the hydrogen atom plays a key role in testing the theory of quantum electrodynamics, and in the determination of fundamental constants, such as the Rydberg constant or the proton charge radius. Since 2010, a disagreement has been found between the proton radius deduced from the spectroscopy of muonic hydrogen and the CODATA recommended value, relying on experiments conducted on electronic hydrogen. To date still unsolved, this proton radius puzzle was even recently deepened by new contradictory results, obtained at MPQ (Garching) and LKB (Paris). Pariss experiment aims at measuring the 1S3S transition frequency of the hydrogen atom. It is based on a Doppler-free two-photon excitation, at 205 nm, of an effusive beam of hydrogen at room temperature. Referenced to the Cs clock of the LNE-SYRTE (Paris), it allows to reach a relative uncertainty below one part-per-trillion. I will present this experiment, our latest results, and our current efforts to shed light on the proton radius puzzle. To this end, we plan to cool down our current hydrogen beam and perform a new determination of the 1S-3S transition frequency in H and D. Thereafter, in order to investigate possible systematic effects related to the configuration of our hydrogen beam, an entirely new effusive beam is to be build, pumped by an oil-free vacuum system.

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