

Hyperfine Splitting in Muonic Hydrogen (CREMA collaboration)

Energy levels of muonic hydrogen, the bound state of proton and muon, are very sensitive to the inner structure of the proton. The two-photon exchange contribution can be inferred from the ground-state hyperfine splitting (1S-HFS), the energy separation of the singlet ($F=0$) and triplet ($F=1$) spin states. The CREMA collaboration at the Paul Scherrer Institute aims to measure the 1S-HFS with an accuracy of 1-2 ppm to extract the two-photon exchange contribution with a relative accuracy of about 100 ppm by means of laser spectroscopy. A custom pulsed laser system is being built, producing 5 mJ pulses at a tunable wavelength around $6.8\ \mu\text{m}$ and a bandwidth of less than 100 MHz. We will present the measurement principle, and show details of our laser and detection system.

Working group

WG4

Primary author: Mr AFFOLTER, Lukas (PSI - Paul Scherrer Institut)

Presenter: Mr AFFOLTER, Lukas (PSI - Paul Scherrer Institut)

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