

Spectroscopy of CH₅⁺

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This poster reviews the longstanding efforts of spectroscopy of CH₅⁺ in Cologne. In 2005, the first overview spectrum of CH₅⁺ recorded at 110K with the method of laser induced reactions (LIR) in a 22-pole trapping apparatus unambiguously proved the structure (consisting of tripod and H₂-moiety) and fluxionality of this exceptional molecule [1]. Some years later, the spectra of all deuterated variants were recorded [2], indicating that the deuterons tend to occupy the tripod, while the hydrogen atoms prefer the H₂-moiety.

Recently, the 22-pole trapping apparatus has been combined with a frequency comb and an optical parametric oscillator (OPO), allowing to obtain high-resolution spectra of single rovibrational lines with a relative precision and accuracy on the order of 10⁻⁹ [3]. Additionally, we completed a new 4K trapping machine, and made first successful tests of laser induced inhibition of complex generation (LIICG) [4]. With this new method, several thousand CH₅⁺ ions are stored in a dense 4K helium buffer gas environment and are continuously irradiated by the OPO. Resonant excitation of the bare ionic species hinders the attachment of He to CH₅⁺ and this can be detected by mass spectrometric means. The combination of both breakthroughs will hopefully tame the 'enfant terrible of molecular spectroscopy'.

[1] O. Asvany et al., *Science* **2005**, 309, 1219

[2] S. Ivanov et al., *Nat. Chem.* **2010**, 2, 298

[3] O. Asvany, J. Krieg, S. Schlemmer, *Rev. Sci. Instr.* **2012**, 83, 093110

[4] O. Asvany, S. Brünken, L. Kluge, and S. Schlemmer, *Appl. Phys. B*, submitted