

Abstract Submitted
for the DAMOP19 Meeting of
The American Physical Society

Laser induced fluorescence detection of cold formaldehyde on the $\tilde{A}^1A_2 \leftarrow \tilde{X}^1A_1 4_0^1$ electronic transition MARTIN IBRÜGGER, MAXIMILIAN LÖW, MARTIN ZEPPENFELD, GERHARD REMPE, Max Planck Institute of Quantum Optics — Laser induced fluorescence (LIF) is a diverse and powerful tool used in many areas of research. Here, we present a LIF-based detection scheme for our experiments on cold and ultracold formaldehyde [1]. Molecules are excited via the $\tilde{A}^1A_2 \leftarrow \tilde{X}^1A_1 4_0^1$ electronic transition and the emitted fluorescence photons are focused by a pair of mirrors (covering a solid angle of $\sim 70\%$) onto a photomultiplier. The lack of a cycling transition as well as the need for continuous wave operation make stray light suppression a major challenge. This is overcome by extensive beam cleaning and an intricate aperture configuration, thereby reducing stray light by over 6 orders of magnitude. The scheme allows state selective detection of the molecules with discrimination of individual M-sublevels. In combination with a double-pass saturation spectroscopy setup, this enables us to perform precise Stark spectroscopy on the electronic transition, allowing us to determine molecule parameters for the excited electronic state. Furthermore, we are able to measure lifetimes of individual excited rotational states, showing a strong dependence on the rotational quantum numbers.

[1] A. Prehn *et al.*, *Phys. Rev. Lett.* **116**, 063005 (2016)

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Date submitted: 01 Feb 2019

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