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Investigation of electric trap dynamics and Sisyphus cooling of formaldehyde using an improved detection scheme MARTIN IBRÜGGER, MAXIMILIAN LÖW, MARTIN ZEPPENFELD, GERHARD REMPE, Max Planck Institute of Quantum Optics — The unique properties of cold polar molecules make them ideal systems for a wide variety of applications in quantum physics. We demonstrated in the past that optoelectrical Sisyphus cooling is a very promising approach to produce a large number of electrically trapped molecules at sub-millikelvin temperatures [1], providing an ideal starting point for these applications. The implementation of an improved detection scheme based on laser induced fluorescence increased our signal by almost an order of magnitude with further improvements expected. Moreover, the method provides us with state selectivity and can even resolve single rotational M-sublevels. We thereby gain new insight into the dynamics of molecules in our electric trap, including, e.g. the state dependence of the contribution of Majorana losses to the trap lifetime and the state-dependent loading and unloading rates. Further investigation of the optoelectrical cooling scheme is expected to result in higher molecule numbers as well as lower temperatures. This will enable collisional studies and improved high-precision spectroscopy of cold formaldehyde in the near future.
[1] A. Prehn *et al.*, *Phys. Rev. Lett.* **116**, 063005 (2016)

Martin Ibrgger
Max Planck Institute of Quantum Optics

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