Cavity ring-down spectroscopy with an optical feedback frequency stabilized laser

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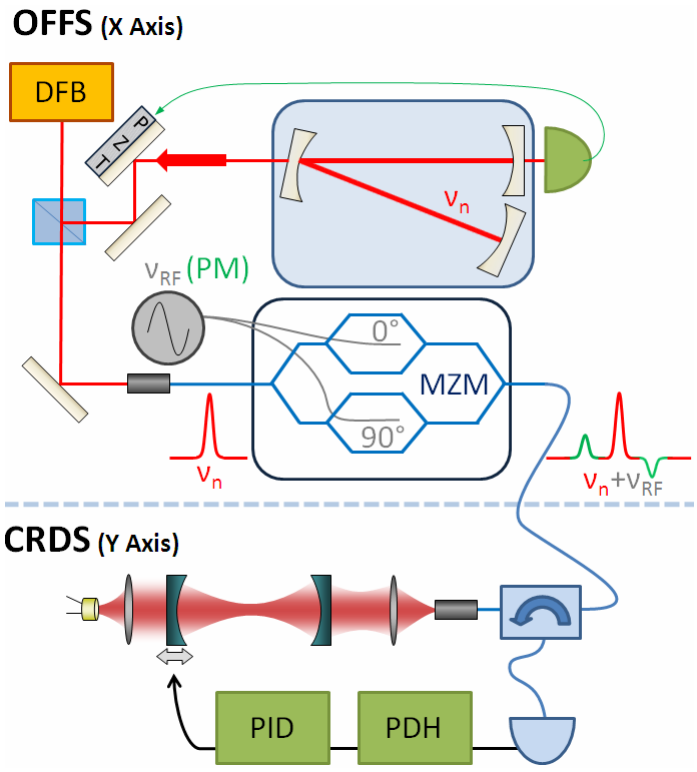
We introduce a novel cavity ring-down spectroscopy (CRDS) technique which combines subkilohertz frequency resolution with an absorption detectivity at the 10^{-13} cm^{-1} level.

This unprecedented performance is based on a distributed-feedback diode laser that is optical-feedback locked to a highly stable V-shaped cavity [1]. Continuous tunability over 1 THz is achieved by selecting reference cavity modes and using an innovative single-sideband modulation scheme.

The frequency stability of this source is subsequently transferred to a linear ring-down cavity by means of an all-fibered Pound-Drever-Hall locking scheme, which maximizes cavity transmission.
We present first experimental results obtained with our new OFFS-CRDS spectrometer. They show its suitability for demanding applications in molecular absorption line shape metrology, such as optical isotopic ratio measurements or a redetermination of the Boltzmann constant.



[1] J. Burkart, D. Romanini, S. Kassi, *Optics Letters* **2013**, *38(12)*, 2062-2064.