MOLECULAR BEAM DENSITY MEASUREMENT WITH CAVITY-ENHANCED ABSORPTION SPECTROSCOPY

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Molecular beams have played an important role in chemical physics research, and beam density is crucial in determining beam properties, reaction rate, and differential cross-section in chemical dynamic experiments. However, few results present the absolute molecular beam density at the moment. We set up an experimental setup that combines the supersonic molecule beam and cavity-enhanced method. The absorption spectrum of carbon monoxide in the beam is continuously recorded when the beam is passing the cavity and we have demonstrated that the absolute molecular beam density can be measured. The absorption spectrum of the CO $R_3(0)$ transition in the beam is shown in figure 1, the beam density can be obtained by measuring the absorption spectrum at different pressures and correcting the effective absorption length. It is expected that with the laser-locked cavity-enhanced method beam density of other molecules, such as C_2H_2, H_2O, CH_4, etc., can be measured quantitatively, which is significant in the crossed molecular beam experiments. This also provides a new method for measuring reaction products in chemical dynamic experiments.

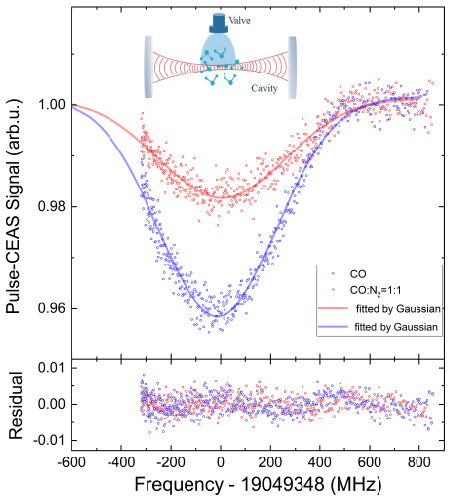

Figure 1: CEAS of carbon monoxide $R_3(0)$ transition in the beam.