ADIABATIC RAPID PASSAGE AND OTHER NONLINEAR SPECTROSCOPIC EFFECTS IN THE SPECTRA OF NITRIC OXIDE AND METHANE AT 5 μm

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Following rapid passage experiments by McCulloch, Duxbury and Langford using a pulsed down-chirp quantum cascade laser spectrometer, we have extended the method by utilizing a novel system in which short red or blue frequency chirped pulses can applied to specific molecular velocity classes across a Doppler broadened molecular absorption line. The output from the QCL passes through an astigmatic Herriott cell with an effective path length of approximately 100 m. The molecules studied in this way have been nitric oxide and methane. We will describe a variety of nonlinear optical phenomena which can be explored in this way, including adiabatic following and the Autler-Townes effect. The relationship between this selective probing of specific velocity groups of the Doppler broadened lines and the adiabatic passage experiments involving all velocity components will be described.