MASKED VELOCITY MAP IMAGING AS A WAY TO OBTAIN ONE-PHOTON DOPPLER-FREE SPECTRA

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A new experimental approach will be presented that allows elimination of the Doppler broadening of one-photon or multi-photon transitions detected by ionization. The approach simply involves masking the detector under velocity map imaging conditions so that only those products having no velocity component parallel to the laser propagation direction are detected. The resolving power and versatility of this method will be demonstrated and compared to conventional Doppler-free and Doppler-reduced spectroscopic techniques. Laser linewidth limited rotationally resolved spectra of the $A - X$ transition of NO resulting from the NO_2 photodissociation and the $B - X$ transition of both room temperature CO and hot CO fragmented from OCS will be presented. Rotational analysis yields significantly improved rotational constants for the CO $B(v' = 0)$ state.