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Population distribution in a three-level ladder system interacting with ultrafast laser pulses that have been subjected to a sinusoidal spectral phase modulation HYOUNGUK JANG, BACHANA LOMSADZE, CHARLES FEHRENBACH, ERIC SCHULTZ, BRETT DEPAOLA, Kansas State Univ — Shaping the spectral phase in ultrafast laser pulses has led to greater understanding of the interaction between light and matter. In this work, a sinusoidal spectral phase is impressed upon ultrafast laser pulses using a pulse shaper. The effect of this phase on the level populations in three-level ladder excitation is measured. As is well known, if a sinusoidal spectral phase is added to a single pulse the result is a regularly spaced series of pulses in the time domain. The temporal spacing between the pulses, as well as the pulse-to-pulse phase difference is determined by parameters in the sinusoidal phase function. By varying these parameters, constructive or destructive interference can occur in the excitation probability of the transitions under study. In this work, the 5s-5p-5d system in atomic Rb was studied. Landscape maps were created that show measured population in the uppermost state of the ladder as a function of pulse-to-pulse spacing and phase. In some cases, these maps showed measured contrast ratios as high as 150.

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