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**Population transfer between ground state and coherent superposition of excited states by spectrally shaped broadband pulses** SERGEY ZHDANOVICH, University of Brithish Columbia, EVGENY SHAPIRO, MOSHE SHAPIRO, JOHN HEPBURN, VALERY MILNER, University of British Columbia — We demonstrate a method for executing complete, robust and selective population transfer from a single ground state to a coherent superposition of multiple excited states. The method is based on simultaneous execution of multiple adiabatic passages with shaped broadband laser pulses. It enables full control over the relative amplitudes and phases of the eigenstates in the target superposition. Our approach is experimentally implemented using $4s_{1/2} \rightarrow \{4p_{1/2}, 4p_{3/2}\}$ transition in atomic Potassium. We show that, unlike the excitation with unshaped pulses, our method is insensitive to overall laser intensity. Prospects of complete population transfer into shaped molecular wavepackets are discussed.

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