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Maximum Attainable Field-free Molecular Orientation of a Thermal Ensemble with Near Single-cycle THz Pulses[1] SHENG-LUN LIAO, Center for Quantum Science and Engineering and Department of Physics, National Taiwan University, Taiwan, TAK-SON HO, HERSCHEL RABITZ, Department of Chemistry, Princeton University, USA, SHIH-I CHU, Department of Chemistry, University of Kansas, USA — Recently single-cycle THz pulses has been demonstrated in the laboratory to successfully induce field-free orientation in gas-phase polar molecules at the room temperature. We examine for the first time the maximum attainable field-free molecular orientation with optimally shaped linearly polarized near single-cycle THz laser pulses of a thermal ensemble. Large-scale benchmark optimal control simulations are performed, including rotational energy levels with the rotational quantum numbers up to J=100 for OCS linear molecules. The simulations are made possible by an extension of the recently formulated fast search algorithm, the two-point boundary-value quantum control paradigm (TBQCP), to the mixed-states optimal control problems in the present work. It is shown that a very high degree of field-free orientation can be achieved by strong, optimally shaped near single- cycle THz pulses.

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