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Counter-Propagating Coherent Stimulated Raman Spectroscopy for Remote Sensing in Air LUQI YUAN, Texas A&M University, ANDREW TRAVERSO, DMITRI VORONINE, PANKAJ JHA, KAI WANG, ALEXEI SOKOLOV, MARLAN SCULLY — We analyze phase-matching conditions in various four-wave mixing schemes for coherent nonlinear optical spectroscopy in the counter-propagating beam configuration. Coherent stimulated Raman spectroscopy satisfies the conditions and gives a signal containing specific molecular spectroscopic information. A counter-propagating broadband and a narrowband pulses are used to measure the Raman spectrum with a single shot. In addition, the nonresonant background due to the nondegenerate four-wave mixing is suppressed. Using this technique we develop a new scheme for standoff spectroscopy in atmosphere by using nitrogen molecules in air as a gain medium for remote lasing.

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