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Atmospheric remote sensing via optically pumped CO_2 laser[1]
ANTON SHUTOV, MARIIA SHUTOVA, ALEXANDER GOLTSOV, ALEXEI SOKOLOV, Texas A&M University, MARLAN SCULLY, Texas A&M University, Baylor University — With the growing global warming problem atmospheric remote sensing, especially remote detection of CO_2 levels, has become a hot topic nowadays. Here we discuss an idea on how CO_2 gas in air can be turned into a laser medium. This type of CO_2 laser is pumped via Raman vibrational mode excitation of the nitrogen present in air. We propose an experiment to implement this type of a laser, where vibrational excitation of nitrogen is produced by a pair of Raman-resonant laser pulses. We quantify the efficiency of the Raman excitation process by observing cascaded Raman sideband generation. When excitation of the first vibrational state takes place in some portion of nitrogen molecules, it is accompanied by generation of multiple Stokes and anti-Stokes sideband. Following the excitation of the vibrations in nitrogen, carbon dioxide molecules become excited due to collisions and lasing takes place as in a conventional carbon dioxide laser.

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