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Towards Quantum Amplification by Superradiant Emission of Radiation ZHENHUAN YI, MATTHEW MORRISON, CHRIS O'BRIEN, CHARLES BALLMANN, JONATHAN THOMPSON, ALEXEI SOKOLOV, Texas A&M University, College Station, TX 77843, USA, GOMBOJAV ARIUNBOLD, Texas A&M University, College Station, TX 77843, USA; National University of Mongolia, Ulaanbaatar 210646, Mongolia, MARLAN SCULLY, Texas A&M University, College Station, TX 77843, USA; Princeton University, Princeton, NJ 08544, USA; Baylor University, Waco, TX 76798, USA — Atomic coherence effect has revealed many fascinating phenomena. Recently, our group proposed a new amplification mechanism which requires no population in excited state yet light amplification at high frequency can be achieved by the parametric resonance between the driving field and the collective superradiant oscillations of the atomic coherence, thus named Quantum Amplification by Superradiant Emission of Radiation (QASER). To get enough gain, QASER requires high atomic density and a strong driving field. In order to observe this effect, we experimentally study the optical properties of dense Rubidium vapor which is strongly pumped by nanosecond laser pulses. Experiments were done with two different setups: (1) heated rubidium cell pumped by tunable pulsed laser and (2) rubidium heatpipe pumped by 1064 nm pulses from Nd:YAG laser. We observed possible coherent emissions in these systems. We also analyze some effects that could hinder the observation of QASER.

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