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A new type of optical parametric amplifier for coherent X-ray generation WAYNE HUANG, LUOJIA WANG, Texas A&M University, HERMAN BATELAAN, University of Nebraska-Lincoln, MARLAN SCULLY, Texas A&M University — Unlike the usual optical parametric amplification, the quantum amplification by super-radiant emission of radiation (QASER) suggests that amplification can only occur when the pump frequency is equal to the difference of the seeded frequencies. The physical mechanism behind QASER is called difference parametric resonance. The difference frequency can be potentially many order of magnitude lower than the seeded frequencies. Therefore, one could use infrared light as pump and build a difference parametric resonance based parametric amplifier for coherent X-ray generation. In this presentation I would like to discuss the mechanism of difference parametric resonance in a coupled-oscillator system, which captures the main physics of QASER as well as other physical realizations of the difference parametric resonance. A perturbation analysis is given to provide more insight into the origin of the amplification process as well as the experimental conditions necessary for realizing difference parametric resonance. We will also briefly discuss several proposals of realizing difference parametric resonance in electronic, mechanical, and acoustic systems.

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