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Mechanisms of stimulated Hawking radiation in laboratory Bose-Einstein condensates[1] YI-HSIEH WANG, TED JACOBSON, University of Maryland, MARK EDWARDS, Georgia Southern University, CHARLES W. CLARK, Joint Quantum Institute — We simulate and reproduce the results of a recent experiment [2] that reported observations of a sonic analog black hole laser [3] in a Bose-Einstein condensate (BEC). In the experiment, a time-swept step potential was applied to a trapped cigar-shaped BEC of ^{87}Rb, thereby creating white hole (WH) and black hole (BH) event horizons. Exponential growth of a density wave in the WH–BH cavity and the emission of Hawking radiation were observed. We show that the solution of the time-dependent Gross-Pitaevskii equation gives good agreement with the experiment with no adjustable parameters. The Hawking radiation in this experiment is not self-amplifying, but is stimulated by a growing Bogoliubov-Čerenkov mode [4] that is generated at the WH event horizon. We use scaling arguments to identify a class of feasible experiments that can provide more distinctive signatures of Hawking radiation and of the dominant Bogoliubov-Čerenkov mode that stimulates it.

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