

Abstract Submitted
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Simulation of a black hole laser in a Bose-Einstein condensate¹

TED JACOBSON, YI-HSIEH WANG, Univ of Maryland-College Park, MARK EDWARDS, Georgia Southern University, CHARLES W. CLARK, Joint Quantum Institute — In a recent experiment [1], J. Steinhauer generated a black/white hole analog by sweeping a potential step through a quasi-one-dimensional Bose-Einstein condensate, and observed behavior that he proposed could be identified as the black hole laser instability and associated Hawking radiation [2]. We have simulated this experiment using the Gross-Pitaevskii (GP) evolution equation for the condensate wave function. The simulation agrees well with the reported experimental results, indicating that the observed behavior can be largely understood at the "hydrodynamic" level of the GP wavefunction. We also identify modified parameters for the experiment which could show a more pronounced signal of the Hawking radiation.

[1] J. Steinhauer, *Nature Phys.* 10, 864 (2014)

S. Corley and T. Jacobson, *Phys.Rev. D*59 (1999) 124011

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