

Abstract Submitted  
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**Nontraditional Quantum Heat Engine with Cold Atoms**<sup>1</sup> YUE JIANG, YUEYANG ZOU, YEFENG MEI, XIANXIN GUO, SHENGWANG DU, Hong Kong University of Science and Technology — We demonstrated a nontraditional quantum heat engine (QHE) with laser cooled  $^{85}\text{Rb}$  atoms basing on electromagnetically induced transparency (EIT), following a recent proposal by S. E. Harris [Phys. Rev. A 94, 053859 (2016)]. Making use of the EIT-induced atomic coherence, we experimentally show that the directional radiation output from the QHE can have a spectral brightness 9 times higher than that of the ambient pumping reservoir, while there is no gain within the system. Our results violate detailed balance and Kirchhoff's law and may also be viewed as an early demonstration of a nontraditional coherence-based QHE.

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