Abstract Submitted
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Quantum optics approach to black-hole thermodynamics via conformal quantum mechanics[1] ABHIJIT CHAKRABORTY, University of Houston, ARASH AZIZI, Texas AM University, HORACIO CAMBLONG, University of San Francisco, CARLOS ORDONEZ, University of Houston, MARLAN SCULLY, Texas AM University — The microscopic origin of the Bekenstein-Hawking entropy (BHE) still remains somewhat elusive for nonextremal generic black holes. Previous works show that conformal symmetry in the near-horizon (NH) region plays a role in determining the holographic area-entropy relation of BHE for extremal black holes. To elucidate further the role scaling symmetry plays in the microscopic origin of the thermal atmosphere around a black hole, we map the NH behavior of the field modes to the scale-invariant Hamiltonian of conformal quantum mechanics (CQM) for any static or stationary black hole. To get the area-entropy relation, we construct a cavity-like setup where two-state atoms in their ground state are injected randomly in the Boulware vacuum of the field and they fall freely towards the black hole. We show that the atoms emit thermal radiation with Hawking temperature, and the change in entropy of the photon field is proportional to the change in the area of the black hole due to the photon generation. We further show that the NH CQM plays a crucial role in determining the proportionality factor which is the same as the BHE. The derivation is valid for any static and stationary black hole and any initial condition for the free fall, proving the universality of our result.

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