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Entanglement Temperature and Entanglement Entropy of Excited States GABRIEL WONG, ISRAEL KLICH, University of Virginia, Charlottesville, LEOPALDO A. PANDO ZAYAS, University of Michigan, Ann Arbor, DIANA VAMAN, University of Virginia, Charlottesville — We derive a general relation between the ground state entanglement Hamiltonian and the physical stress tensor within the path integral formalism. For spherical entangling surfaces in a CFT, we reproduce the *local* ground state entanglement Hamiltonian derived by Casini, Huerta and Myers. The resulting reduced density matrix can be characterized by a spatially varying "entanglement temperature." Using the entanglement Hamiltonian, we calculate the first order change in the entanglement entropy due to changes in conserved charges of the ground state, and find a local first law-like relation for the entanglement entropy. Our approach provides a field theory derivation and generalization of recent results obtained by holographic techniques. However, we note a discrepancy between our field theoretically derived results for the entanglement entropy of excited states with a non-uniform energy density and current holographic results in the literature. Finally, we give a CFT derivation of a set of constraint equations obeyed by the entanglement entropy of excited states in any dimension. Previously, these equations were derived in the context of holography.

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