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The canonical ensemble of a self-gravitating matter thin shell in asymptotically AdS

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We consider the canonical ensemble of a spherically symmetric,self-gravitating thin shell of hot quantum matter in an asymptotically anti-de Sitter space. We employ the Euclidean path integral approach to quantum gravity via York framework to determine, in the zero loop approximation, the partition function. The whole analysis yields promptly the mechanics and the thermodynamics of the space as well as its stability. We give to the matter in the shell a barotropic equation of state, and assume that the entropy goes with a power law on the mass of the shell. We find the equilibrium shell spaces and their mechanical and thermal stability. We then compare the hot thin shell Euclidean action with the Hawking-Page black hole action in order to study the possible phase transitions between these two thermodynamic states. We find a first order phase transition, namely, for sufficiently low temperatures the hot shell state is favorable, otherwise the black hole dominates the ensemble.

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