

## Abstract

(Review and report on arXiv:0809.4266). "Quantum gravity in the region very near the horizon of an extreme Kerr black hole (whose angular momentum and mass are related by  $J = GM^2$ ) is considered. It is shown that consistent boundary conditions exist, for which the asymptotic symmetry generators form one copy of the Virasoro algebra with central charge  $c_L = 12J/\hbar$ . This implies that the near-horizon quantum states can be identified with those of (a chiral half of) a two-dimensional conformal field theory (CFT). Moreover, in the extreme limit, the Frolov-Thorne vacuum state reduces to a thermal density matrix with dimensionless temperature  $T_L = 1/2\pi$  and conjugate energy given by the zero mode generator,  $L_0$ , of the Virasoro algebra. Assuming unitarity, the Cardy formula then gives a microscopic entropy  $S_{micro} = 2\pi J/\hbar$  for the CFT, which reproduces the macroscopic Bekenstein-Hawking entropy  $S_{macro} = Area/4\hbar G$ . The results apply to any consistent unitary quantum theory of gravity with a Kerr solution. We accordingly conjecture that extreme Kerr black holes are holographically dual to a chiral two-dimensional conformal field theory with central charge  $c_L = 12J/\hbar$ , and in particular that the near-extreme black hole GRS1915 + 105 is approximately dual to a CFT with  $c_L \sim 2 \times 10^{79}$ ."