Near horizon superconformal symmetry of rotating BPS black holes in five dimensions [1]

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It has been expected that the Kerr black hole is dual to a two dimensional conformal field theory since the Kerr/CFT correspondence proposed in [1]. The strategy of [1] is as follows. The authors considered the near horizon limit of the Kerr black hole, and studied the asymptotic symmetry group (ASG). Then they found that the ASG is generated by a Virasoro algebra with the nonvanishing central charge and, furthermore, this central charge reproduces the Bekenstein-Hawking entropy of the extremal Kerr black hole via the Cardy's formula. These facts lead us to the conjecture described above. It has been also shown later that the same strategy is applicable to more general rotating black holes. However, nobody knows the concrete dictionary of the correspondence at present. We attempt to extract more informations about black holes with help from the supersymmetry.

We focused on the BMPV black hole which is the rotating BPS black hole in five dimensions. Following the strategy of the Kerr/CFT, we considered the near horizon limit of the BMPV black hole and studied fluctuations of all dynamical fields: graviton, $U(1)$ gauge field and gravitino. In particular, we chose the appropriate boundary conditions for all fluctuations and investigated the asymptotic supersymmetry group (ASSG), which consists of transformations preserving the boundary conditions (modulo trivial transformations). In the result, we showed that the ASSG is generated by a super-Virasoro algebra with the vanishing central charge.

Besides the different values of the central charges, there is also another difference between the Virasoro algebras. Generally, extremal black holes have an $SL(2,R) \times U(1)$ isometry group. The Virasoro algebra we found is originated in $SL(2,R)$ part, on the other hand, the one of the Kerr/CFT is originated in $U(1)$ part. Therefore it is a challenging problem to extend our approach to the four dimensional Kerr black hole, and this issue remains for future work.

Please see [2] for details.

References

[1] M. Guica, T. Hartman, W. Song and A. Strominger, "The Kerr/CFT Correspondence," Phys. Rev. D **80**, 124008 (2009) [arXiv:0809.4266 [hep-th]].

[2] M. Nakamura and N. Yokoi, to appear.

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