Holographic Duals of Kaluza-Klein Black Holes

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Based on arXiv:0811.4177 [hep-th]
(collaboration with Tatsuo Azeyanagi [Kyoto U.] and Seiji Terashima [YITP])
Brown-Henneaux’s holography

- near-horizon asymptotic symmetry ↔ Virasoro sym (⇒ CFT\(_2\) ?)
- we know little about the CFT\(_2\) and correspondence principles
- apparently no relation to string or SUSY

(cf.)

AdS/CFT correspondence

- near-horizon AdS isometry ↔ conformal symmetry
- well-analyzed in many cases
- correspondence principle is (partly) understood (GKP-Witten, etc)
- based on string theory (and SUSY)
Recently, on the direction of Brown-Henneaux’s holography, the Kerr/CFT correspondence was proposed:

For extremal 4D Kerr BH,
- We look near to the event horizon
- Under some boundary condition, $\mathbb{U}(1)_\phi$ symmetry enhances to Virasoro
  $\Rightarrow$ dual chiral CFT ! (?)
- We can determin $c$ and $T$ for the CFT
  $\Rightarrow S_{\text{micro}} = S_{\text{BH}}$ !

Correct $S_{\text{micro}}$ derivation without string method...
What is Kerr/CFT??

However, there are too many mysteries about this methods. We want to know…

- What is the dual chiral CFT? What does it stand for?
- What class of BH can it be applicable?
  What happens for non-extremal case?
- What is the relation to string theory or string duality?

etc...
We then consider the rotating Kaluza-Klein black holes:

- black hole on $4D \times S^1$ (pure grav.)
- in 4D view, rotating BH with electric/magnetic charges. (include 4D dyonic RN, etc)
- two $U(1)$ fibers $U(1)_\phi$, $U(1)_y$
- D0-D6 system in string theory (extremal, but non-BPS)
For the near-horizon of this BH, we can take two different boundary conditions ⇒ two different dual chiral CFT$_2$’s !!

| Boundary Condition (A) | U(1)$_\phi$ | U(1)$_y$ | $S_{micro}$ |
|------------------------|-------------|-----------|-------------|
| Boundary Condition (B) | Virasoro    | U(1)      |             |
|                        | U(1)        | Virasoro  |             |

Although $c$ and $T$ are completely different in each case, $S_{micro}$ agrees exactly in either case!

What does it tells us, especially in string point of view ??

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Thank You

Please also listen to tomorrow’s long-time talk by Mr. Nishioka...
(our great competitor !)