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])

Black Holes and Holography : Brown-Henneaux's method

Brown-Henneaux [Comm.Math.Phys. 104 (1986)]

- Brown-Henneaux's holography
  - near-horizon asymptotic symmetry $\leftrightarrow$ Virasoro sym ($\Rightarrow$ 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 $\leftrightarrow$ conformal symmetry
  - well-analized in many cases
  - correspondence principle is (partly) understood (GKP-Witten, etc)
  - based on string theory (and SUSY)

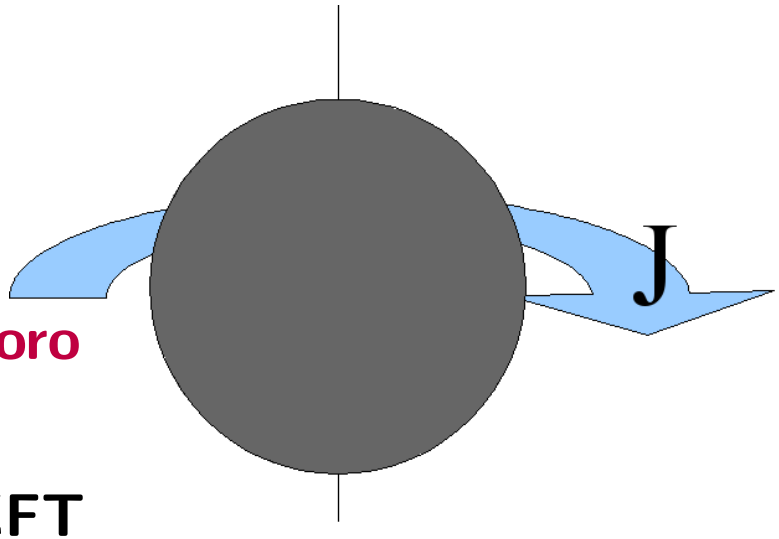
Kerr/CFT Correspondence

Guica-Hartman-Song-Strominger [arXiv:0809.4266]

Recently, on the direction of Brown-Henneaux's holography, Kerr/CFT correspondence was proposed:

For extremal 4D Kerr BH,

- **We look near to the evant horizon**
- **Under some boundary condition, $\mathrm{U}(1)_\phi$ symmetry enhances to Virasoro $\Rightarrow$ dual chiral CFT ! (?)**
- **We can determin c and T for the CFT $\Rightarrow S_{micro} = S_{BH}$!**



Correct S_{micro} derivation without string method...

What is Kerr/CFT ??

However, there are too many mysteries about this methods.

We want to know...

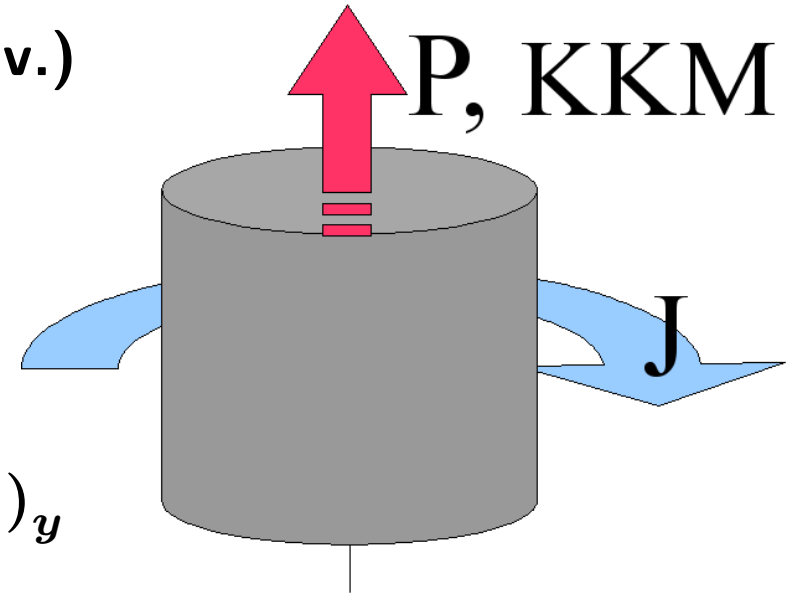
- **What is the dual chiral CFT ? What does it stand for ?**
- **What class of BH can it be applicable ?**
  What happens for non-extremal case ?
- **What is the relation to string theory or string duality ?**

etc...

Rotating Kaluza-Klein Black Holes

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 $\mathrm{U}(1)$ fibers $\mathrm{U}(1)_\phi$, $\mathrm{U}(1)_y$**
- **D0-D6 system in string theory (extremal, but non-BPS)**

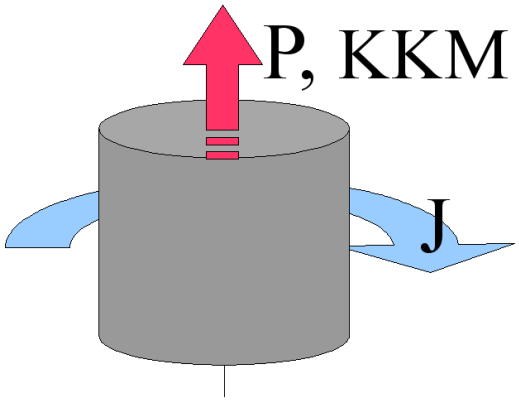


Kaluza-Klein/CFT Correspondences

For the near-horizon of this BH,

we can take two different boundary conditions

$\Rightarrow$ two different dual chiral CFT$_2$'s !!



	$\mathrm{U}(1)_\phi$	$\mathrm{U}(1)_y$	S_{micro}
Boundary Condition (A)	**Virasoro**	$\mathrm{U}(1)$	$\frac{\pi^2}{3}c^\phi T^\phi = S_{BH}$
Boundary Condition (B)	$\mathrm{U}(1)$	**Virasoro**	$\frac{\pi^2}{3}c^y T^y = S_{BH}$

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 ??

Thank You

Please also listen to tomorrow's long-time talk

by Mr. Nishioka...

(our great competitor !)