

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 [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-analyzed in many cases
- correspondence principle is (partly) understood (GKP-Witten, etc)
- based on string theory (and SUSY)

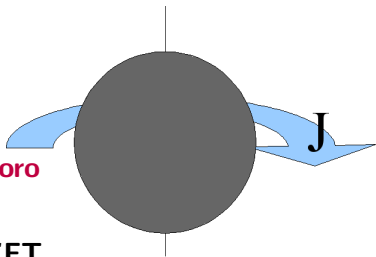
Kerr/CFT Correspondence

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 event horizon
- Under some boundary condition, $U(1)_\phi$ symmetry **enhances to Virasoro**
 \Rightarrow dual chiral CFT ! (?)
- We can determine 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.

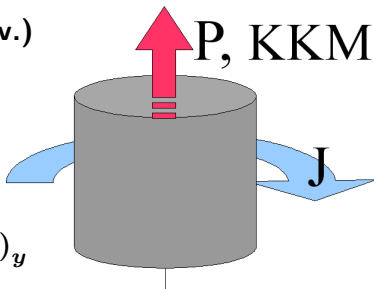
We want to know...

- 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** ?

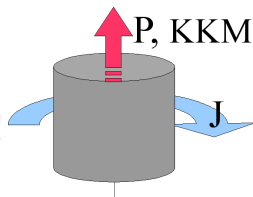
etc...

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**
 \Rightarrow **two different dual chiral CFT₂'s !!**



	$U(1)_\phi$	$U(1)_y$	S_{micro}
Boundary Condition (A)	Virasoro	$U(1)$	$\frac{\pi^2}{3} c^\phi T^\phi = S_{BH}$
Boundary Condition (B)	$U(1)$	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 tell us, especially in string point of view ??

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