Supersymmetric Grey Galaxies and Revolving Black Holes

Vineeth Krishna

(Tata Institute of Fundamental Research, Mumbai)

With D. Jain, S.Minwalla, C. Patel, K. Sharma and S. Kim, E. Lee
[2311.xxxx]

The missing parameter?

$\frac{1}{16}$ **- BPS Black holes in** $AdS_5 \times S^5$ $\Longleftrightarrow$ $\frac{1}{16}$ **- BPS states in** $\mathcal{N} = 4$ **SYM**

(4 parameters) **(5 parameters)**

(Q_1, Q_2, Q_3, J_L) $(Q_1, Q_2, Q_3, J_L, J_R)$

In the special case, when $Q_1 = Q_2 = Q_3$, this discrepancy reads as,

$\frac{1}{16}$ **- BPS Black holes in** $AdS_5 \times S^5$ $\Longleftrightarrow$ $\frac{1}{16}$ **- BPS states in** $\mathcal{N} = 4$ **SYM**

(2 parameters) **(3 parameters)**

(Q, J_L) (Q, J_L, J_R)

The missing parameter?

$\frac{1}{16}$ **- BPS Black holes in** $AdS_5 \times S^5$ $\Longleftrightarrow$ $\frac{1}{16}$ **- BPS states in** $\mathcal{N} = 4$ **SYM**

(4 parameters) (Q_1, Q_2, Q_3, J_L)

(5 parameters) $(Q_1, Q_2, Q_3, J_L, J_R)$

In the special case, when $Q_1 = Q_2 = Q_3$, this discrepancy reads as,

$\frac{1}{16}$ **- BPS Black holes in** $AdS_5 \times S^5$ $\Longleftrightarrow$ $\frac{1}{16}$ **- BPS states in** $\mathcal{N} = 4$ **SYM**

(2 parameters) (Q, J_L)

(3 parameters) (Q, J_L, J_R)

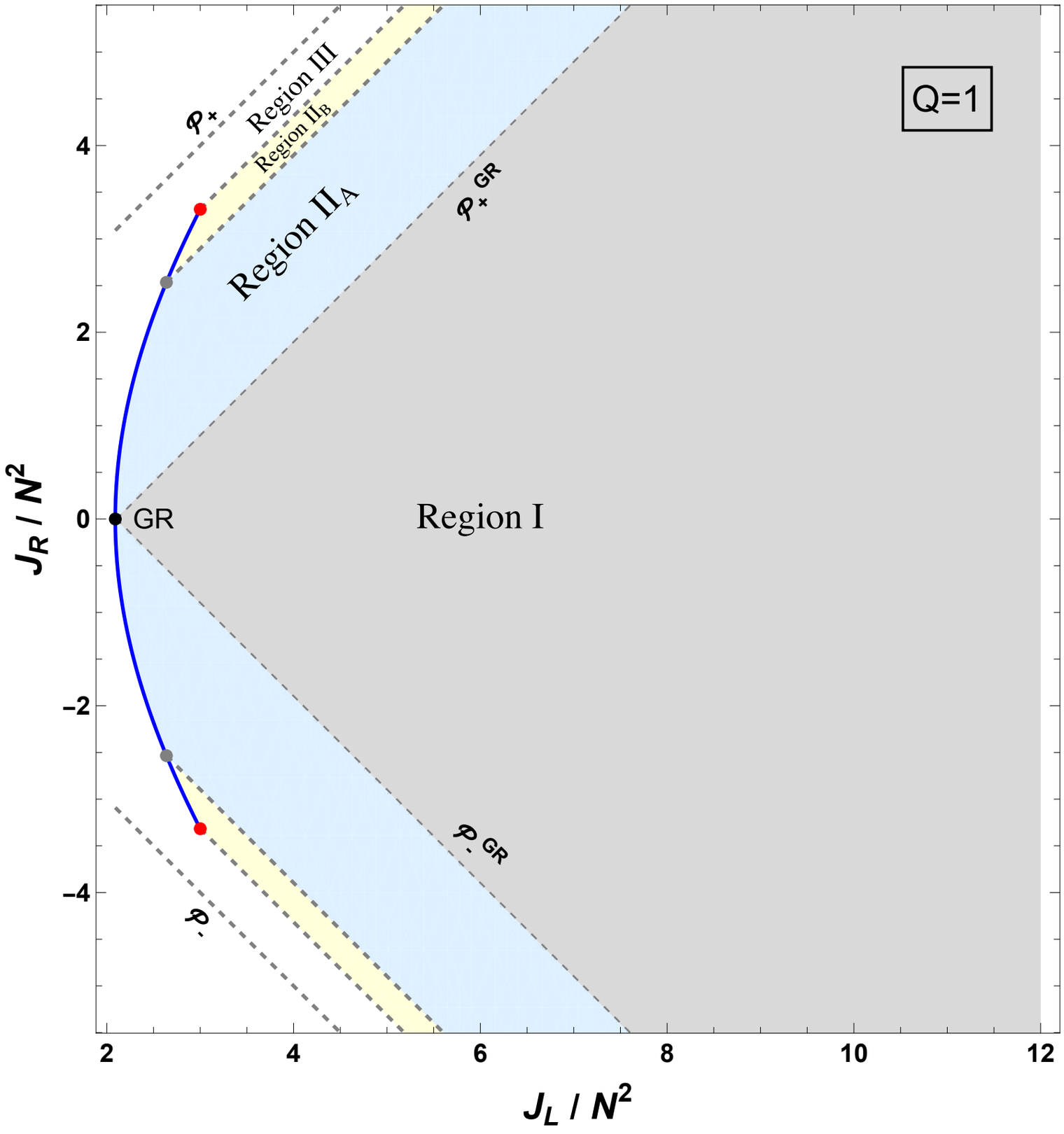
Where to look for the missing black hole solutions?

Hairy Black Holes

Missing Parameter - charges in the hair

Grey Galaxies and Revolving Black Holes [arxiv:2305.08922]
(Non-Interacting Model) (S. Minwalla, S. Kim…)

Microcanonical Phase Structure



Superconformal Index - Phase transition (A new prediction!)

The new solutions in some subset of charge space can dominate the Superconformal Index

This suggests that there could be a phase transition in the saddle point of the superconformal index

Currently working on establishing this result

Superconformal Index - Phase transition (A new prediction!)

The new solutions in some subset of charge space can dominate the Superconformal Index

This suggests that there could be a phase transition in the saddle point of the superconformal index

Currently working on establishing this result

Charged Hairy BPS black holes

There are regions in the charge space where the charged modes want to condense

Non-Interacting model breaks down

Construct new solutions perturbatively

Multi-partite entanglement in AdS/CFT

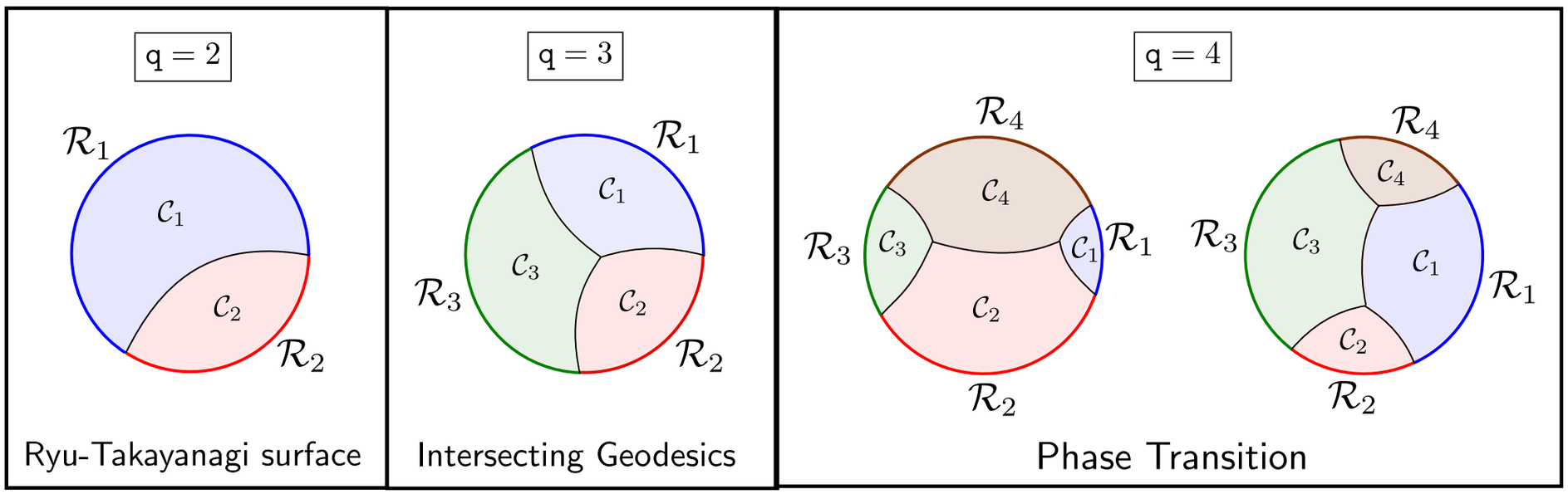
(w/ Abhijit Gadde, …)

New measure of Multipartite Entanglement - “Multi-Entropy”

[arXiv:2206.09723]

Generalizations of Multi-Entropy and their holographic duals

[arXiv:2304.06082]



Monotonicity properties of Multi-partite measures

[arXiv:2308.16247]

Holographic entropy inequalities