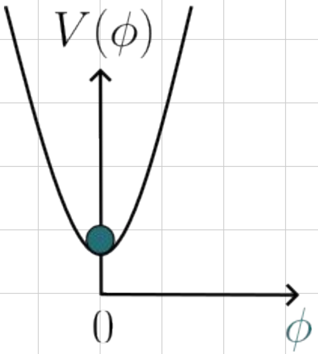
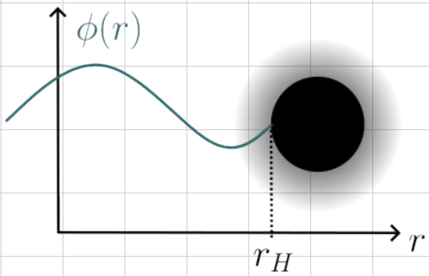


BLACK HOLE PROBES
IN STABILIZED VACUA

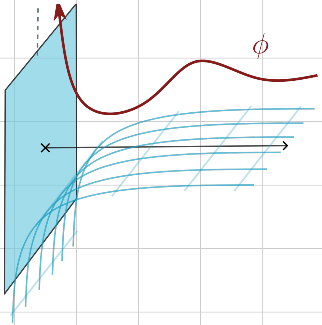


Matilda Delgado

Based on:
[24xx.xxxxx] M. Delgado, D. Mayerson, S. Reymond, T. Van Riet

BIG PICTURE

Running solutions are solutions to the EOMs **where scalar fields depend on spacetime coordinates**



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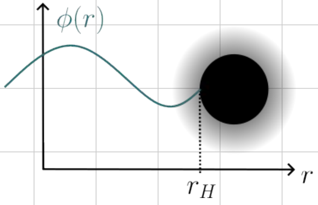

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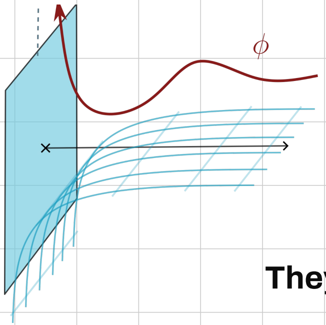

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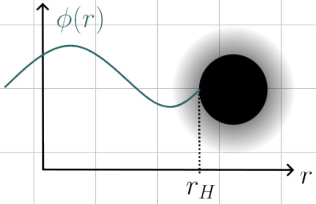

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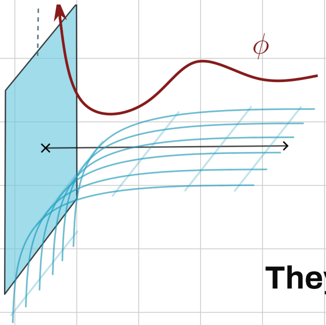

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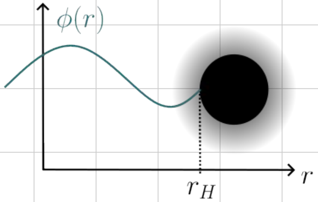

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They provide a map between spacetime and moduli space:

↪ they can be used as 'experimental' probes of different corners of moduli space
↪ in particular, the boundaries of moduli space where UV physics manifest

PROBE BLACK HOLES

Specific running solution: **charged Black Holes** in stringy EFTs

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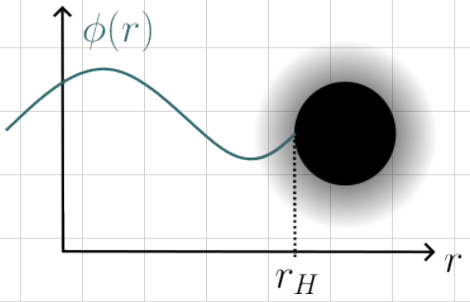

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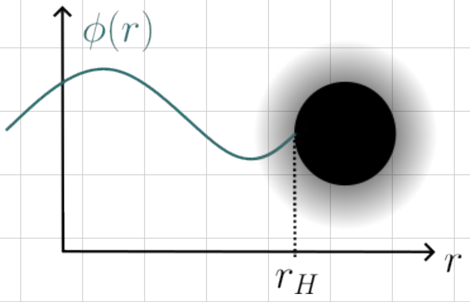
Celebrated example: the 4d N=2 attractor mechanism [S. Ferrara, R. Kallosh, A. Strominger '95]



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[Delgado, Montero, Vafa '22]

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.... Let's start with a toy model ....

A TOY MODEL

Dilatonic Charged Black Hole in the presence of a dilaton mass:

$$S = \int dx^4 \sqrt{-g} \left\{ R - \tfrac{1}{2}(\partial\phi)^2 - \tfrac{1}{4} e^{a\phi} F^2 - \frac{1}{2} m^2 \phi^2 \right\}$$

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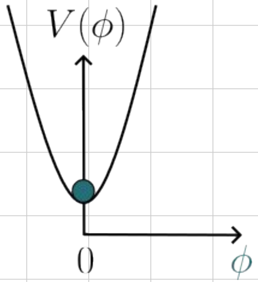
Typical scale: m



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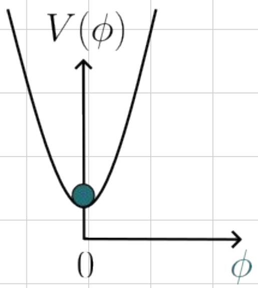
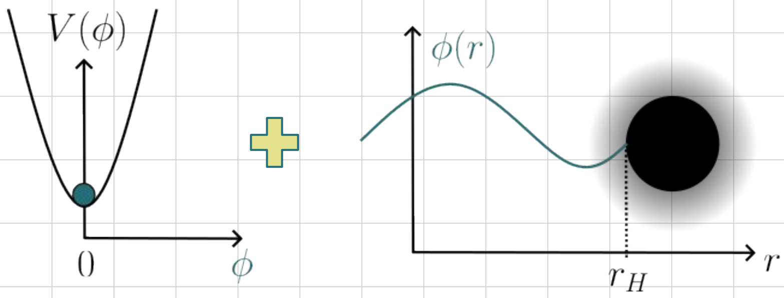


2) Close to the BH, the BH also contributes and tries to attract the dilaton to a new value at the horizon
Typical scale: R(P,Q)



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To figure out what happens near the BH, consider the set of equations:

$$\partial_i V + \frac{1}{R^4}\partial_i V_{BH} = 0\,,$$

$$V - \frac{2}{R^2} + \frac{1}{R^4} V_{BH} = 0\,,$$

Scalar potential

Horizon size

Effective black hole potential

[M. Montero, T. Van Riet, and G. Venken, '20]

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The black hole reduces to the dilatonic BH solution.

(This is the usual set-up in the literature)

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Let's see how the RN BH is modified is we make the dilaton a little lighter

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➡ Probing farther points in moduli space corresponds to taking a smaller (more singular) black hole

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a top-down example!

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Explicit scenario: A toroidal Orbifold Model $\mathbb{T}^6/\mathbb{Z}_4$
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Numerical approach?

WORK IN PROGRESS

STAY TUNED!

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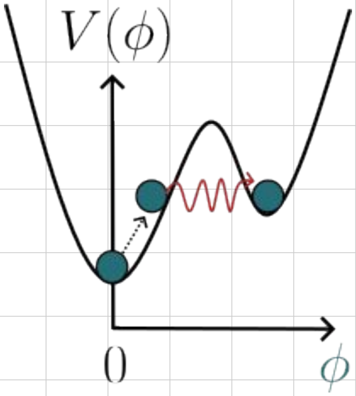

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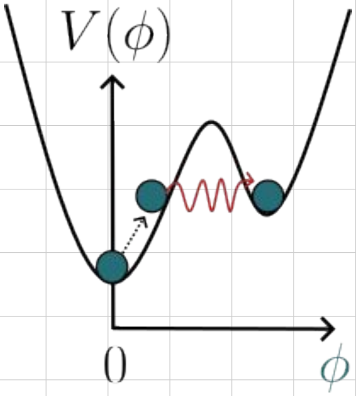

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In other words, they usually need UV physics to happen near the horizon (infinite distance in moduli space)

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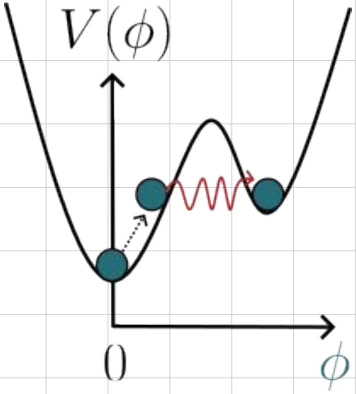

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