Holographic Modular Flow in the Semiclassical Limit

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Work in progress w/ Hong Liu

Semiclassical Limit

CFT		AdS
$N \to \infty$	$\longleftrightarrow$	$G_N \to 0$

Subalgebra-subregion duality: changes in the structure of the boundary operator algebra lead to emergent geometric features of the semiclassical bulk dual

Single trace operators well defined	$\longleftrightarrow$	Sharply defined causal wedge
Full boundary algebra	$\longleftrightarrow$	Bulk entanglement wedge

Leutheusser and Liu, 2212.13266

The Role of Modular Flow

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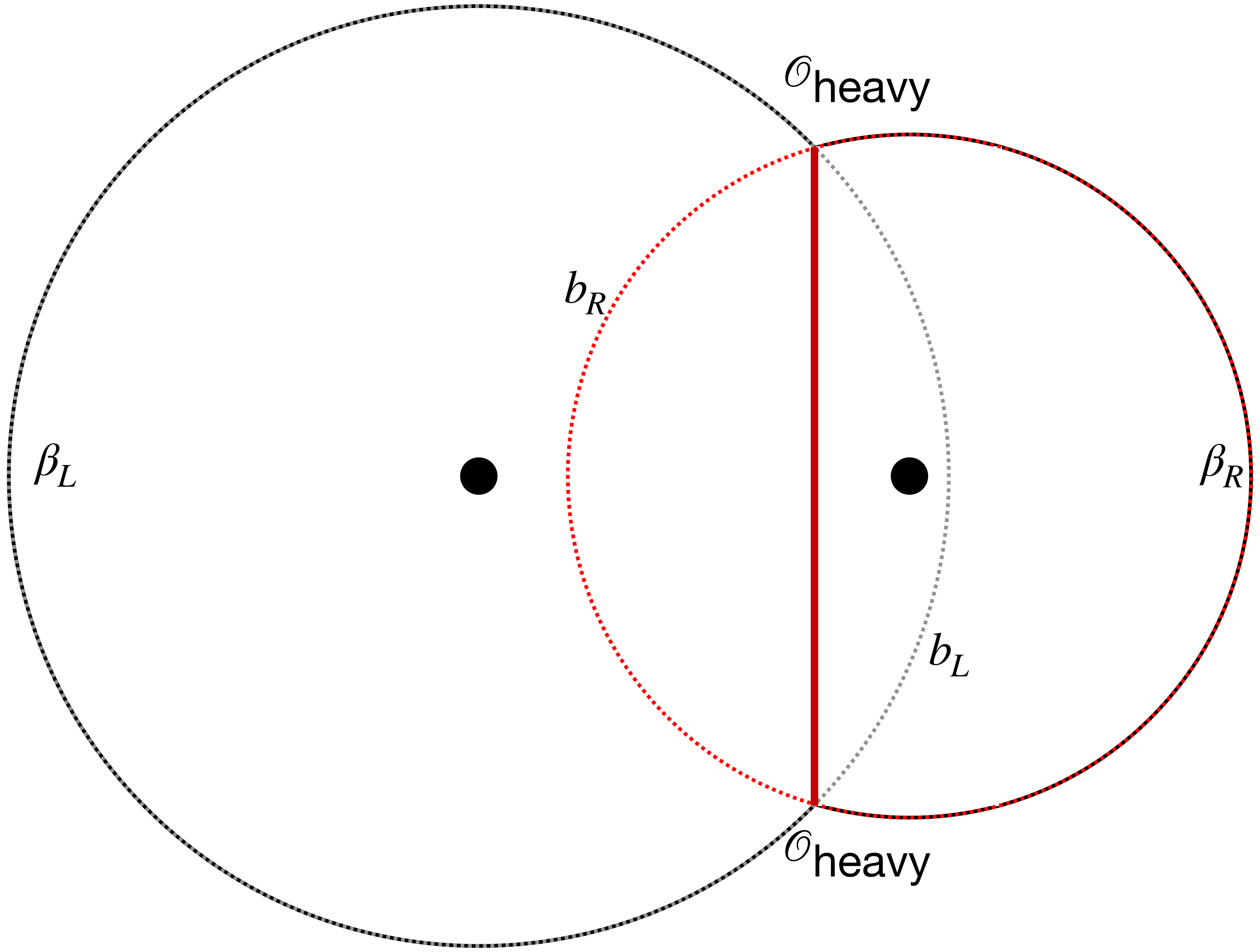
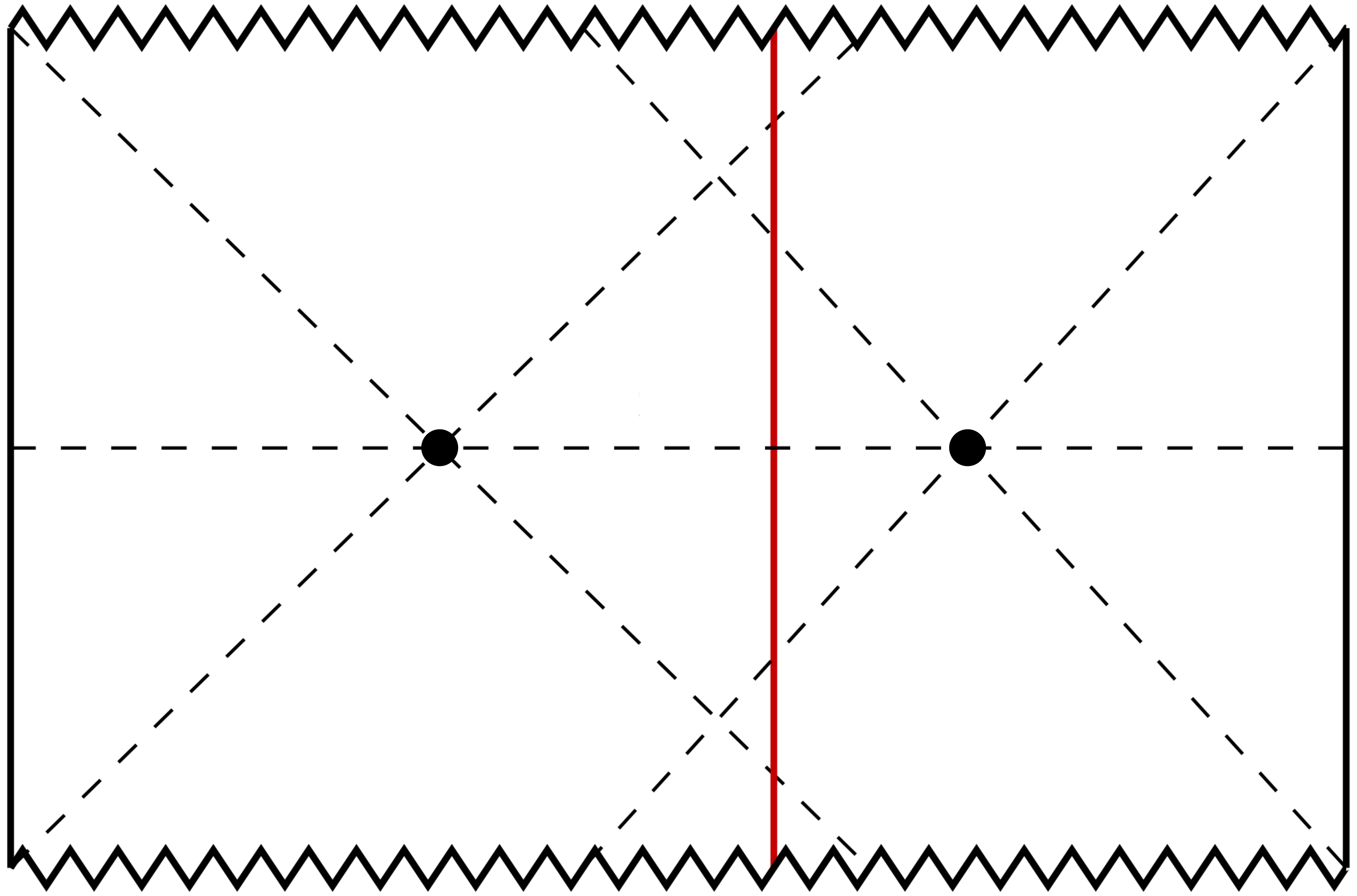
Confirm expectations and also provide boundary interpretation of existence of bulk QES as fixed point of boundary modular flow

Partially Entangled Thermal States

Euclidean

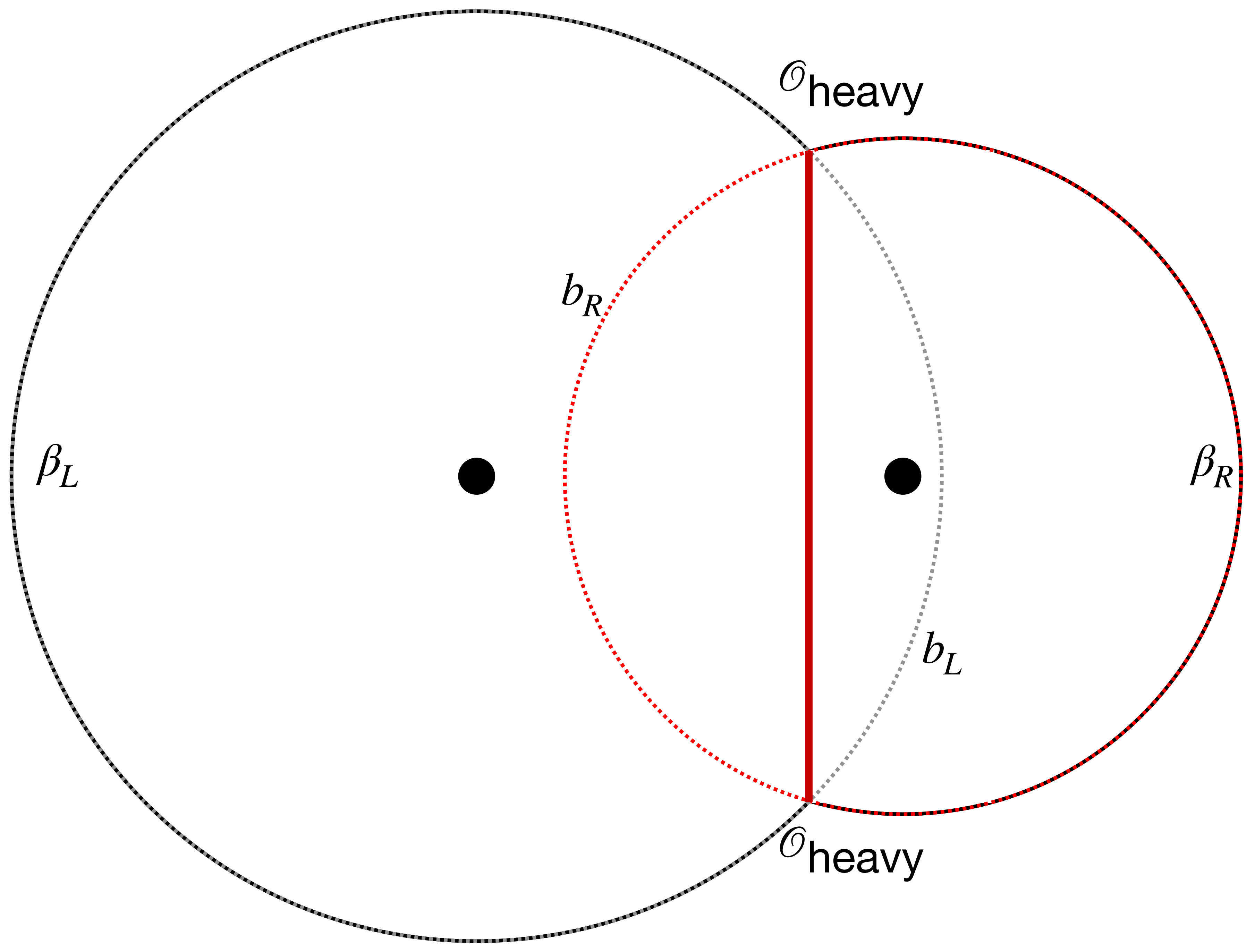


Lorentzian



Goel, Lam, Turiaci, Verlinde, 1807.03916

Modular Flowed Correlation Functions



Can show

$$\langle \mathcal{O}_{s_1}(t_1)\mathcal{O}_{s_2}(t_2)\rangle = \langle \mathcal{O}(t_1 + ib_R/2)\mathcal{O}(t_2)\rangle$$

for $s_1 + s_2 > s_*(t_1)$

$$b_R \leq \beta = \beta_R + \beta_L$$

Applies in d > 2 as well in some cases

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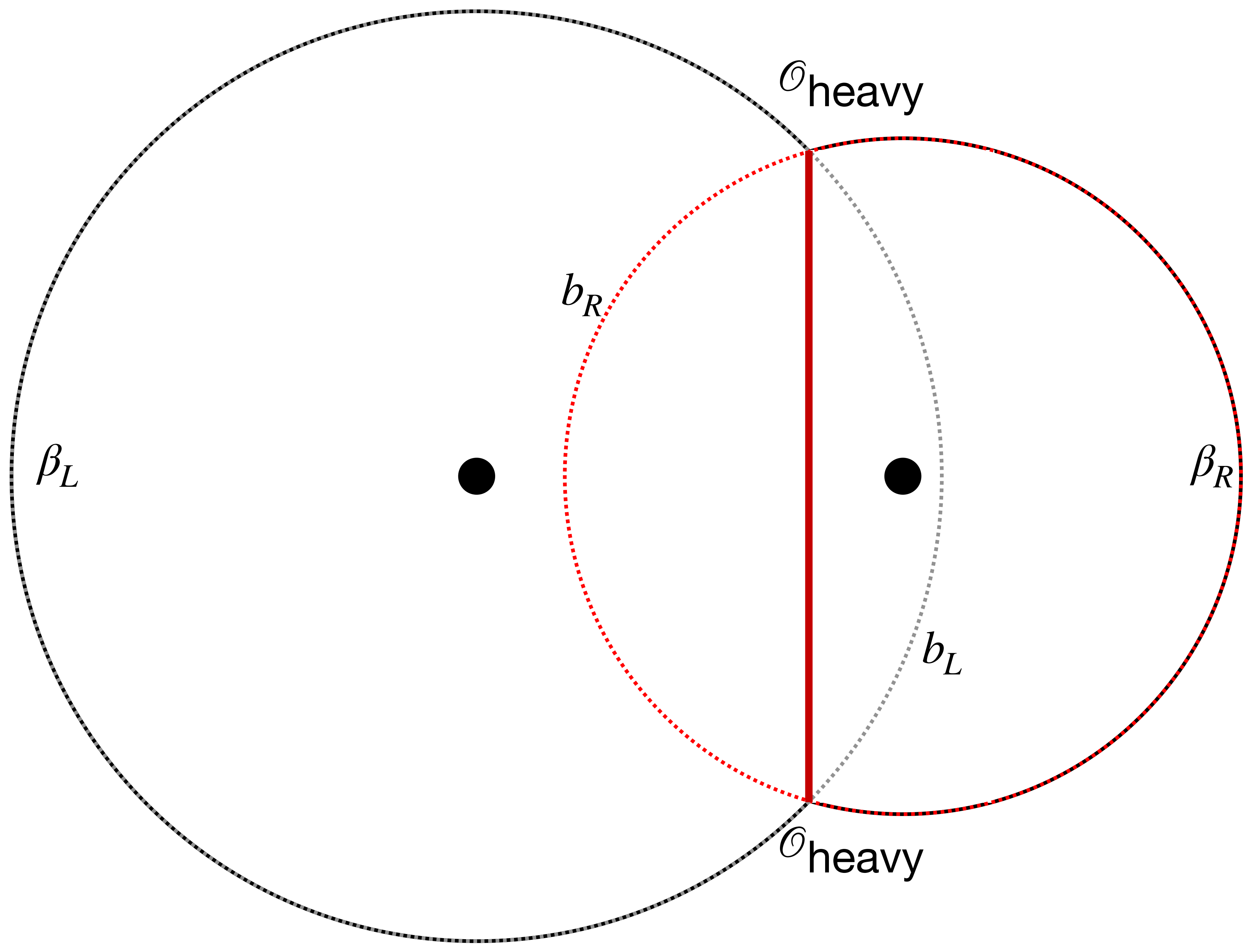

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Current work: Can we understand the features of erratic-N behavior in the semiclassical limit using these explicit expressions?