

Testing the weak gravity conjecture using type I strings with broken supersymmetry

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based on arXiv:1811.11199 and work in progress,
in collaboration with E. Dudas and S. Lüst

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The swampland and supersymmetry breaking

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- and the **weak gravity conjecture**:

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For every gauge field, there must exist a charged state
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In what follows:

a test of the WGC for the R-R 2-form in type I string theory with broken supersymmetry

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For the R-R forms of string theory: D-branes. With SUSY, they are BPS-states and saturate the WGC \implies **modified if SUSY**

The string theory setup

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Unoriented worldsheets, ex: one-loop closed amplitude in 10-dimensional spacetime

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Always understood as a **spontaneous breaking**

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~~SUSY~~ generates **exponential quintessence-like runaway potentials**:

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Interest revived by the de Sitter conjecture (although irrelevant phenomenologically here)

D1-D1 interactions and WGC

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Closed string exchange \iff open-string cylinder calculation
(with Dirichlet-Dirichlet boundary conditions):

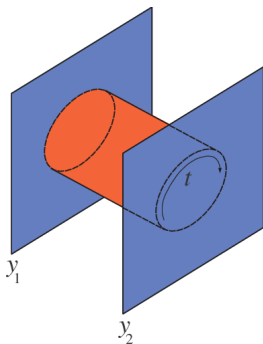


figure from JHEP 0305 (2003) 055

We focus on D1-D1 systems:

$$\mathcal{A}_{11} = \frac{1}{\pi\sqrt{\alpha'}} \int_0^\infty \frac{d\tau_2}{\tau_2^{3/2}} e^{-\frac{\tau_2 r^2}{4\pi\alpha'}} \left[P_m - P_{m+1/2} \right] \frac{\theta_2^4}{2\eta^{12}} \left(\frac{i\tau_2}{2} \right)$$

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Outlook

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Future directions: other SUSY and non-SUSY tests (ex: more gauge fields, different SUSY breaking), application to actual stringy black holes (and their Q/M), more realistic quintessence models

Thank you!