The problematic backreaction of SUSY-breaking branes

Daniel Junghans

Institut für Theoretische Physik &
Centre for Quantum Engineering and Spacetime Research
Leibniz Universität Hannover

Collaboration with J. Blåbäck, U. H. Danielsson, T. Van Riet,
T. Wrase and M. Zagermann

arXiv: 1009.1877, 1105.4879, 1110.????

Overview

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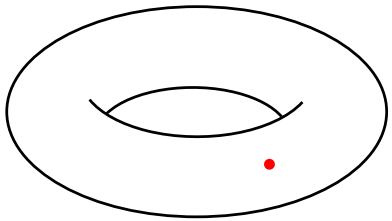
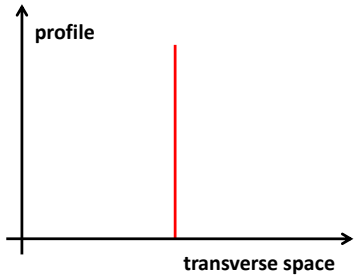
Localized sources

- Localized sources (D-branes, O-planes) are important ingredients in string theory/supergravity compactifications:
  SUSY breaking, tadpole cancelation, dS uplifts, ...

  e.g. KKLT 03; Douglas, Kallosh 10





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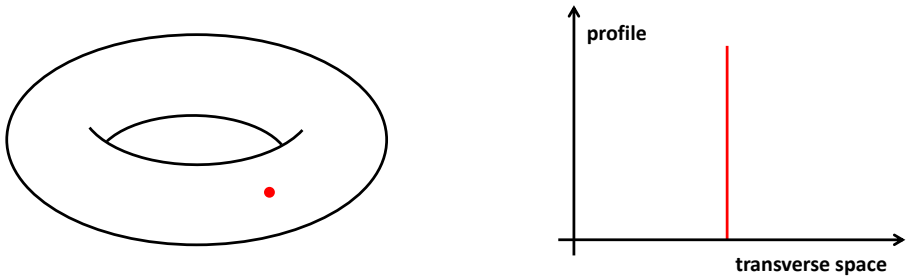

- Equations of motion (Einstein, dilaton, RR fields) include delta functions:

$$S_{\text{loc}} = \mu_p \mathrm{e}^{\frac{p-3}{4}\phi} \int \mathrm{d}^{10}x \sqrt{g} \delta^{(9-p)}(x) - \mu_p \int C_{p+1} \wedge \delta^{(9-p)}$$

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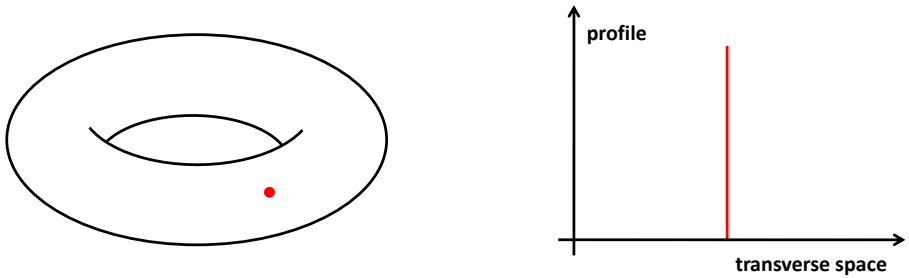

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Usually hard to solve!

Smearing

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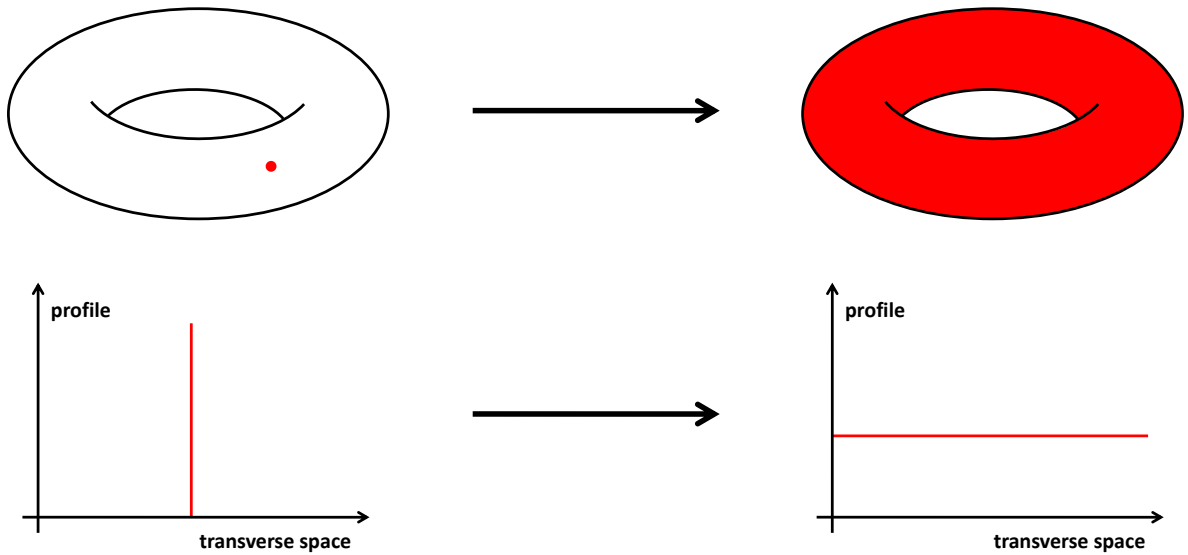

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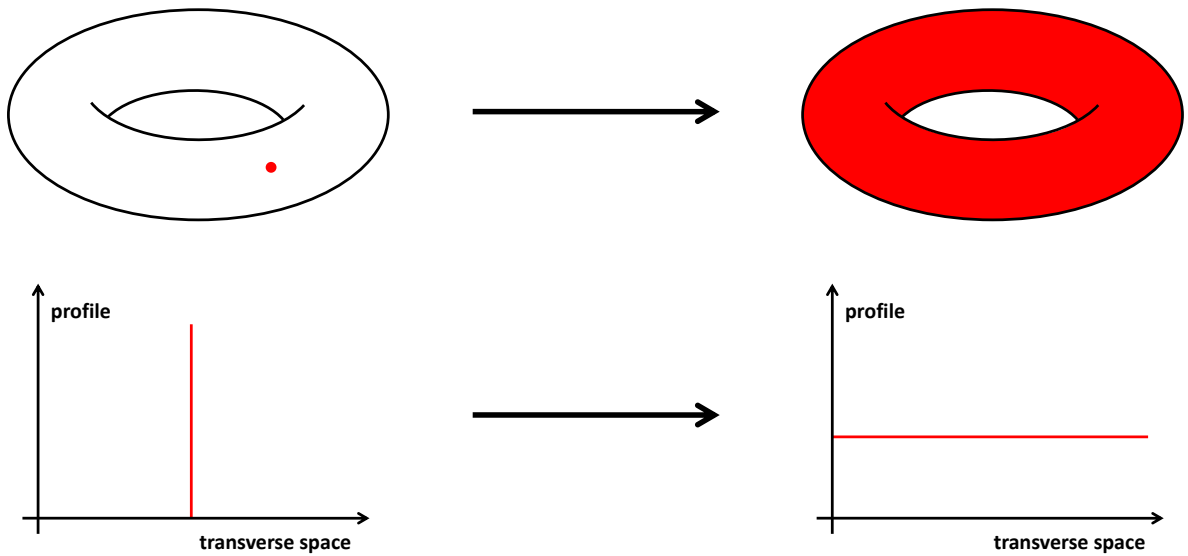

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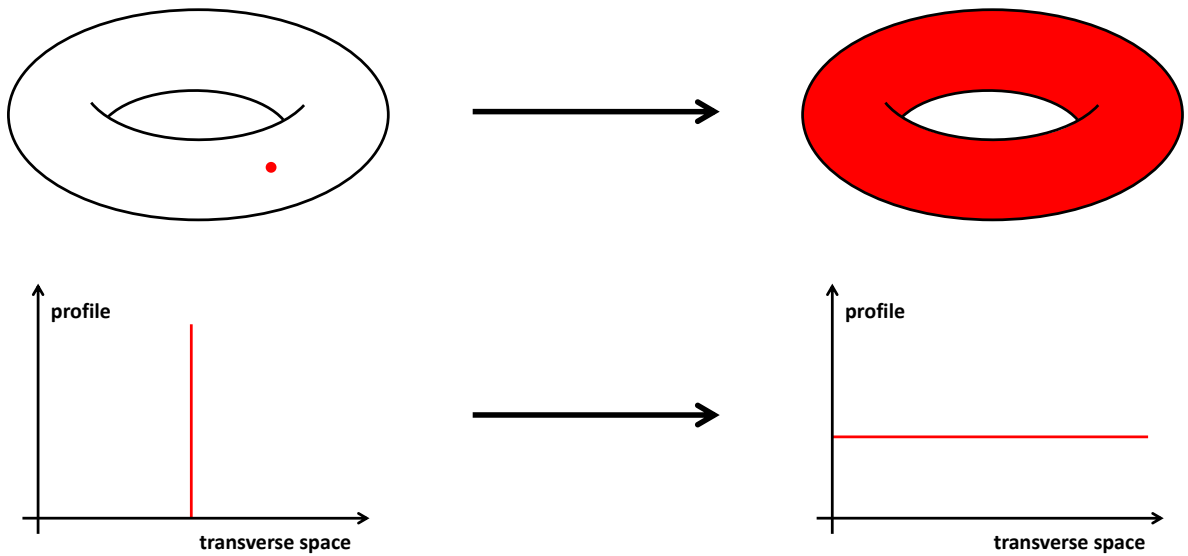

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Easier!

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Smearing justified in non-BPS setups?

Overview

Setup

- Idea: explicitly address this question in a simple setup!

Blåbäck, Danielsson, DJ, Van Riet, Wrase, Zagermann 11

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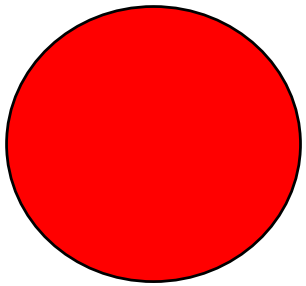

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$$\phi, F_0 = \text{const.}, \qquad H = \pm\tfrac{5}{2} F_0 \mathrm{e}^{7/4\phi} \star_3 1$$

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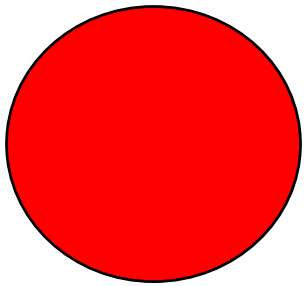

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Is there also a localized solution?

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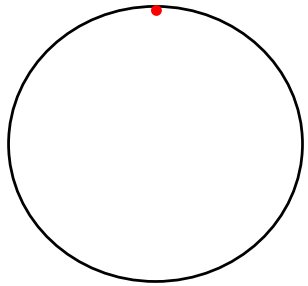

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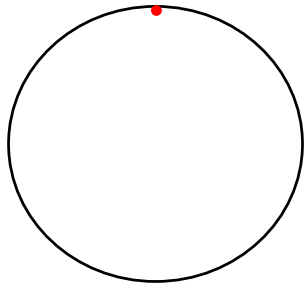

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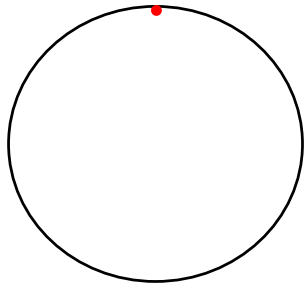

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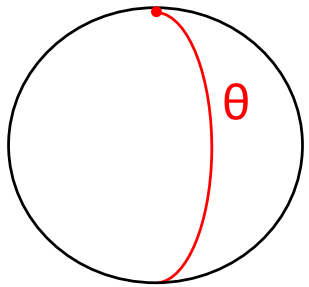
- Most general ansatz compatible with symmetries: warped AdS times a conformal sphere, i.e.

$$\mathrm{d}s^2 = \mathrm{e}^{2A}\mathrm{d}s_7^2 + \mathrm{e}^{2B}\mathrm{d}s_3^2,$$

and (a priori) arbitrary

$$\phi, F_0, F_2, H$$

- Further simplify problem: form eoms demand F_0 to be constant and determine F_2 and H up to an unknown function α, spherical symmetry demands eoms to only depend on 1 angle θ



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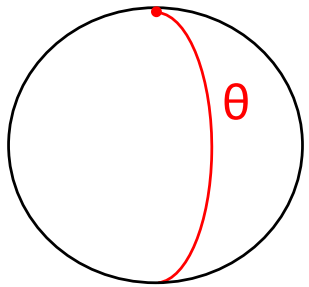

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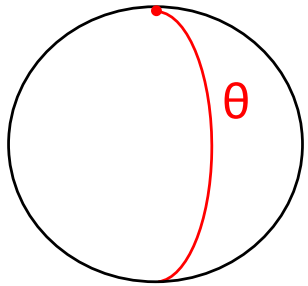

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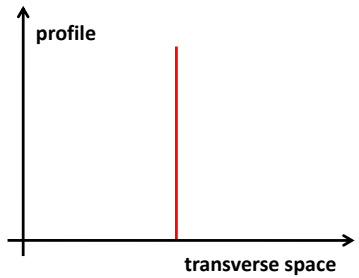
Seems tractable...

Localized solution?

- Finally: check whether is there a localized solution!



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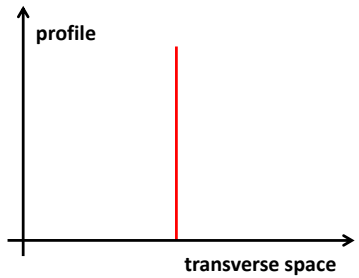

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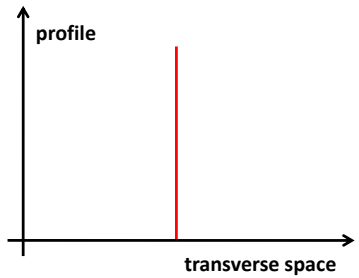

- Need to solve bulk eoms, but what are the correct boundary conditions for A, B, ϕ, α in the near-source region?
- Expand (possibly divergent) functions around the source and solve eoms locally to find strong restriction:

  1. standard 'flat space' bc: flux/source are BPS near source

     cf. Janssen, Meessen, Ortín 99

  2. 'unusual' bc: flux/source not BPS, H has divergent energy density

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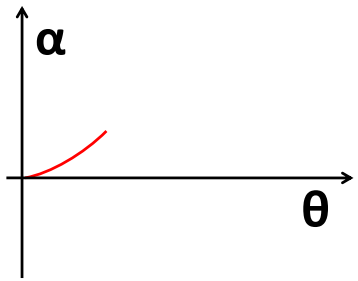

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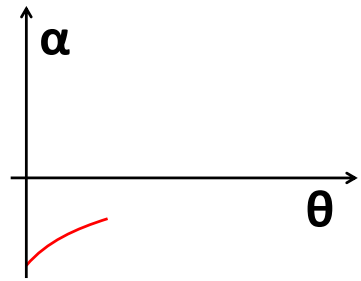

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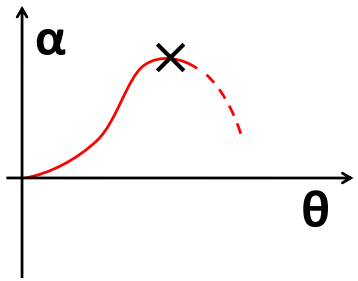

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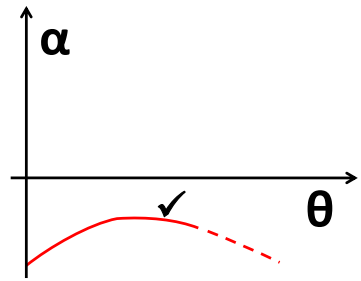

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No physical, localized solution existent?

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