SURFACE DEFECTS IN MASSIVE IIA

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Supersymmetric Objects

- Quantum gravity is intrinsically non-perturbative $\to$ extended objects in the UV (strings, branes, KK monopoles, O-planes...).
- Supersymmetry is necessary for stability $\to$ BPS objects.
- Low-energy regime $\to$ $D = 11, 10$ supergravities.
- The physics of BPS objects is captured by classical solutions.
- Consistent truncations to low dimensions $\to$ Many supergravities for d and $\mathcal{N}$.
- Gauged supergravities $\to$ Moduli stabilization and AdS_d vacua.

The AdS/CFT Correspondence

- Some branes (or their intersections) include closed string AdS vacua in their near-horizon.

- **AdS/CFT correspondence**: Dual description of AdS string vacua as the RG fixed point of the QFT living on the worldvolume of the brane. This fixed point is given by a strongly-coupled SCFT in the large N limit and corresponds to the near-horizon limit.

  [Maldacena. 1997.] [Witten. 1998.].

- Consistent truncation to a d-dimensional gauged supergravity $\longrightarrow$ RG flow across dimensions, conformal defects...

  [Boonstra, Skenderis, Townsend. 1998.] [Maldacena, Nunez. 2000.]

  [Karch, Randall. 2001.].

Outline

- RG flows across dimensions and defects.
- Minimal $d = 7$, $\mathcal{N} = 1$ gauged supergravity.
- Solutions with non-trivial 3-form gauge potential.
- M-theory uplifts and dyonic membrane.
- AdS_3 slicing and truncation from massive IIA.
- Holographic conformal defect SCFT_2 within the $\mathcal{N} = (1,0)$ SCFT_6.

RG Flows Across Dimensions and Defects

Two complementary interpretations of some SUSY solutions in a d-dimensional gauged supergravity:

- **RG Flows** : $\mathrm{AdS}_d \longrightarrow \mathrm{AdS}_{p+2} \times \mathcal{M}_{d-p-2}$ are dual to $\mathrm{SCFT}_{d-1} \longrightarrow \mathrm{SCFT}_{p+1}$. [Maldacena, Nunez. 2000.].

$$ds_d^2 = e^{2U(r)} ds^2_{\mathbb{R}^{1,p}} + e^{2V(r)} dr^2 + e^{2W(r)} ds^2_{d-p-2} \,.$$

- **Defects**: Asymptotically AdS_d warped solutions $\mathrm{AdS}_{p+2} \times_w \mathcal{M}_{d-p-2}$ are dual to a defect SCFT_{p+1} within the SCFT_{d-1} dual to the boundary. [Karch, Randall. 2001.].

$$ds_d^2 = e^{2U(r)} ds^2_{\mathrm{AdS}_{p+2}} + e^{2V(r)} dr^2 + e^{2W(r)} ds^2_{d-p-3} \,.$$

Minimal $d = 7$ Gauged Supergravity

- $\mathcal{N} = 1$, $d = 7$ supergravity multiplet: $(g_{\mu\nu}, X, B_{(3)}, A^i_\mu)$.
- 16 real supercharges preserved and R-symmetry $SU(2)_R$.
- Global symmetry: $G_0 = \mathbb{R}^+_X \times \mathrm{SO}(3)$.
- Gauging:
  - $\mathrm{SU}(2)$ gauge group realized by A^i_μ with gauge coupling g.
  - Chern-Simons mass h for the 3-form $B_{(3)}$.
- Scalar potential:

$$V_g(X) \ = \ 2h^2\,X^{-8} \ - \ 4\sqrt{2}\,gh\,X^{-3} \ - \ 2g^2\,X^2\,.$$

$\longrightarrow$ 1 SUSY AdS_7 vacuum: $X = 1$ and $h = \frac{g}{2\sqrt{2}}$.

[Townsend, van Nieuwenhuizen. 1983.]

The Lagrangian

$$\mathcal{L} = R \star_{(7)} 1 - 5\, X^{-2} \star_{(7)} dX \wedge dX - \frac{1}{2} X^{4} \star_{(7)} \mathcal{F}_{(4)} \wedge \mathcal{F}_{(4)} - V_g \star_{(7)} 1$$
$$- \frac{1}{2} X^{-2} \star_{(7)} \mathcal{F}^{i}_{(2)} \wedge \mathcal{F}^{i}_{(2)} - h\, \mathcal{F}_{(4)} \wedge B_{(3)} + \frac{1}{2} \mathcal{F}^{i}_{(2)} \wedge \mathcal{F}^{i}_{(2)} \wedge B_{(3)} \,.$$

Fluxes:

$$\mathcal{F}^{i}_{(2)} = dA^{i} - \frac{g}{2} \epsilon^{ijk} A^{j} \wedge A^{k} \qquad \text{and} \qquad \mathcal{F}_{(4)} = dB_{(3)} \,.$$

Odd-dimensional self-duality condition:

$$X^{4} *_{(7)} \mathcal{F}_{(4)} \stackrel{!}{=} -2h\, B_{(3)} + \frac{1}{2} A^{i} \wedge \mathcal{F}^{i}_{(2)} + \frac{g}{12} \epsilon_{ijk} A^{i} \wedge A^{j} \wedge A^{k} \,.$$

[Townsend, van Nieuwenhuizen. 1983.]

The SUSY Variations

$$\delta_\zeta \psi_\mu{}^a = \nabla_\mu \zeta^a + ig\,(A_\mu)^a{}_b\,\zeta^b + i\,\frac{X^{-1}}{10\sqrt{2}}\,(\gamma_\mu{}^{mn} - 8\,e_\mu{}^m\,\gamma^n)\,\left(\mathcal{F}_{(2)\,mn}\right)^a{}_b\,\zeta^b$$

$$+\,\frac{X^2}{160}\left(\gamma_\mu{}^{mnpq} - \frac{8}{3}\,e_\mu{}^m\,\gamma^{npq}\right)\mathcal{F}_{(4)\,mnpq}\,\zeta^a - \frac{1}{5}\,f(X)\,\gamma_\mu\,\zeta^a,$$

$$\delta_\zeta \chi^a = \frac{\sqrt{5}}{2}\,X^{-1}\partial\!\!\!/ X\,\zeta^a - i\,\frac{X^{-1}}{\sqrt{10}}\,(\mathcal{F}\!\!\!/_{(2)})^a{}_b\,\zeta^b + \frac{X^2}{2\sqrt{5}}\,\mathcal{F}\!\!\!/_{(4)}\,\zeta^a - \frac{X}{5}\,D_X f\,\zeta^a\,.$$

BPS superpotential:

$$f(X) \;=\; \frac{1}{2}\left(h\,X^{-4} + \sqrt{2}\,g\,X\right)\;,$$

such that

$$V_g(X) \;=\; \frac{4}{5}\left(X^2\,\left(D_X f\right)^2 - 6f(X)^2\right)\;.$$

Backgrounds with Dyonic 3-form

- Metric:

$$ds_7^2 = e^{2U(r)}\, ds^2_{M_3} \,+\, e^{2V(r)}\, dr^2 \,+\, e^{2W(r)}\, ds^2_{\Sigma_3}$$

where $M_3 = \{\mathbb{R}^{1,2}, \mathrm{AdS}_3\}$ and $\Sigma_3 = \{\mathbb{R}^3, S^3\}$.

- Odd-dimensional self-duality $\rightarrow$ Dyonic 3-forms:

$$B_{(3)} = k(r)\,\mathrm{vol}_{M_3} \,+\, l(r)\,\mathrm{vol}_{\Sigma_3}\ .$$

- $SU(2)$ vectors in case of $\Sigma_3 = S^3$:

$$A^i_j = \frac{A(r)}{2\,g}\,\epsilon^{i\,k\,l}\,\omega_{j\,kl}\ .$$

- Dilaton: $X = X(r)$.

Killing Spinors

- Dirac spinor with 16 components organized in a $SU(2)$ doublet of symplectic-Majorana spinors ζ^a satisfying a pseudo-reality condition.
- Killing spinor in case of $M_3 = \mathbb{R}^3$ and $\Sigma_3 = \mathbb{R}^3$:

$$\zeta^a(r) \;=\; Y(r)\;\left(\cos\theta(r)\,\mathbb{1}_8 \;+\; \sin\theta(r)\,\gamma^{012}\right)\;\zeta_0^a\;,$$

- $A_i = 0$: ζ_0^a constant spinor s.t. $\gamma^3\zeta_0^a \stackrel{!}{=} \zeta_0^a \to$ BPS/2.
- If $M_3 = \mathrm{AdS}_3$ and/or $\Sigma_3 = S^3$: Hopf fibration on S^3 and AdS_3!

$$ds^2_{S^3} = \frac{1}{\kappa^2}\left[d\theta_2^2 + \cos^2\theta_2 d\theta_3^2 + (d\theta_1 + \sin\theta_2 d\theta_3)^2\right].$$

- $A_i \neq 0$: $\gamma^3\,\zeta_0^a \stackrel{!}{=} \zeta_0^a$ and $\gamma^{ij}\,\zeta_0^b \stackrel{!}{=} -i\,(\sigma^k)^a{}_b\,\zeta_0^b \to$ BPS/8.

Explicit Flows

- Vanishing vectors $A^i = 0$:
  - $M_3 = \mathbb{R}^3$ and $\Sigma_3 = \mathbb{R}^3$.
  - $M_3 = \mathbb{R}^3$ and $\Sigma_3 = S^3$. Asymptotically AdS_7.
  - $M_3 = \mathrm{AdS}_3$ and $\Sigma_3 = S^3$. Asymptotically AdS_7. Charged flow with $U(r) = W(r)$ and $k(r) = l(r)$.
  - $M_3 = \mathrm{AdS}_3$ and $\Sigma_3 = S^3$. Asymptotically AdS_7 and IR $\mathrm{AdS}_3 \times T^4$.
- Running vectors with numerical integration:
  - $M_3 = \mathbb{R}^3$ and $\Sigma_3 = S^3$. Asymptotically AdS_7.
  - $M_3 = \mathrm{AdS}_3$ and $\Sigma_3 = S^3$. Asymptotically AdS_7.

The Background $M_3 = \mathbb{R}^{1,2}$ and $\Sigma_3 = \mathbb{R}^3$

BPS equations for $U(r)$, $W(r)$, $k(r)$, $l(r)$, $X(r)$, $Y(r)$, $\theta(r)$:

$$U' = \frac{1}{5}\, e^V\, f\, \frac{(3\cos(4\theta)\ -\ 1)}{\cos(2\theta)}\,, \qquad W' = -\frac{2}{5}\, e^V\, f\, \frac{(\cos(4\theta)\ -\ 2)}{\cos(2\theta)}\,,$$

$$Y' = \frac{1}{10}\, e^V\, Y\, f\, \frac{(3\cos(4\theta)\ -\ 1)}{\cos(2\theta)}\,, \qquad \theta' = -e^V\, f\, \sin(2\theta)\,,$$

$$k' = -\frac{4f\, e^{3U+V}}{X^2}\, \tan(2\theta)\,, \qquad l' = \frac{4f\, e^{V+3W}}{X^2}\, \sin(2\theta)\,,$$

$$X' = -\frac{2}{5}\, e^V\, X\, \left(X\, D_X f\ -\ 8f\, \frac{\sin^4\theta}{\cos(2\theta)} \right)\,,$$

$$X\, D_X f\ +\ 4\, f\ \stackrel{!}{=}\ 0\ .$$

The Flow for $M_3 = \mathbb{R}^{1,2}$ and $\Sigma_3 = \mathbb{R}^3$

- Gauge choice on the radial warp factor: $e^V = f^{-1}$
- Supersymmetric flow:

$$
\begin{aligned}
e^{2U} &= \sinh(4r)^{1/5}\coth(2r)\,, & e^{2V} &= \tfrac{4}{h^2}\sinh(4r)^{16/5}\,,\\
e^{2W} &= \sinh(4r)^{1/5}\tanh(2r)\,, & X &= \sinh(4r)^{2/5}\,,\\
k &= \frac{1}{\sqrt{2}\,\sinh^2(2r)}\,, & l &= -\frac{1}{\sqrt{2}\,\cosh^2(2r)}\,,\\
Y &= \sinh(4r)^{1/20}\coth(2r)^{1/4}\,, & \theta &= \arctan\left(e^{-2r}\right)\,.
\end{aligned}
$$

- From the constraint on $f(X) \longrightarrow V_g(X) = \frac{h}{2}X^{-4}$.
- No AdS_7 asymptotics.

Dyonic Membrane in M-Theory

- The M2-M5 bound state [Izquierdo, Lambert, Papadopoulos, Townsend. 1996.]:

$$
\begin{aligned}
ds^2_{11} &= H^{-2/3}\,\tilde{H}^{1/3}\,ds^2_{\mathbb{R}^{1,2}} + H^{1/3}\tilde{H}^{1/3}ds^2_{\mathbb{R}^5} + H^{1/3}\tilde{H}^{-2/3}\,ds^2_{\mathbb{R}^3}\\
F_{(4)} &= \frac{1}{2}\,\cos\xi\,\star_5\,d\,H + \frac{1}{2}\,\sin\xi\,d\,H^{-1}\wedge \mathrm{vol}_{\mathbb{R}^{1,2}}\\
&\quad - \frac{3\,\sin(2\,\xi)}{2\,\tilde{H}^2}\,\mathrm{vol}_{\mathbb{R}^3}\wedge dH
\end{aligned}
$$

with $\tilde{H} = \sin^2\xi + H\,\cos^2\xi\,.$

- H harmonic function on $\mathbb{R}^5 \longleftrightarrow$ smearing of the M2 on the M5.
- $\cos\xi = 0 \longrightarrow$ purely electric case: smeared M2 brane.
- $\sin\xi = 0 \longrightarrow$ purely magnetic case: pure M5 brane.
- Near-horizon: $\mathrm{AdS}_7 \times S^4$.

M2-M5 Bound State and Dyonic 3-Form

- M-theory on T^4 with 4-form wrapping the $T^4 \to V(X) = \frac{h}{2} X^{-4}$ with $A^i = 0$ and $g = 0$.
- Truncation Ansatz:

$$ds_{11}^2 \;=\; X^{-4/3}\, ds_7^2 \;+\; X^{5/3}\, ds_{T^4}^2\,,$$
$$F_{(4)} = Q\, \mathrm{vol}_{T^4}\,.$$

- Reducing the dyonic membrane on a T^4 in the $\mathbb{R}^5$ as

$$ds_{\mathbb{R}^5}^2 = dz^2 + ds_{T^4}^2 \qquad \text{with} \qquad H = 1 + \alpha\, z\,.$$

- From the comparison, one obtains $Q = h\,,\ \alpha = \frac{2h}{\cos\xi}$ and

$$z = \frac{1+\cos^2\xi}{4h\cos\xi} + \frac{\sin^2\xi}{4h\cos\xi}\cosh(2hr)\,.$$

The Charged AdS_7 Flow

- $M_3 = \mathrm{AdS}_3$, $\Sigma_3 = S^3$ and $U(r) = W(r)$, thus

$$ds_7^2 = e^{2U(r)}\,(ds^2_{\mathrm{AdS}_3} + ds^2_{S^3}) \,+\, e^{2V(r)}\,dr^2$$

- It follows that $k(r) = l(r)$, $\theta(r) = 0$, $R_{\mathrm{AdS}_3} = R_{S^3}$, thus

$$B_{(3)} = k(r)\,(\mathrm{vol}_{\mathrm{AdS}_3} \,+\, \mathrm{vol}_{S^3}) \quad \text{and} \quad \zeta^a = Y(r)\,\zeta_0^a .$$

- BPS equations:

$$U' = \frac{2}{5}\,e^V\,f\,, \qquad Y' = \frac{Y}{5}\,e^V\,f\,,$$
$$k' = -\frac{e^{2U+V}\,R_{\mathrm{AdS}_3}}{X^2}\,, \qquad X' = -\frac{2}{5}\,e^V\,X^2\,D_X f\,.$$

Explicit Flow with AdS_3 slicing

- Choose the gauge $e^{-V} = -\frac{2}{5} X^2 D_X f$ and the parameters $h = \frac{g}{2\sqrt{2}}$.
- Integrate the equations for $r \in (0,1)$:

$$
\begin{aligned}
& e^{2U} = \frac{2^{-1/4}}{\sqrt{g}} \left(\frac{r}{1 - r^5}\right)^{1/2} , \quad e^{2V} = \frac{25}{2g^2} \frac{r^6}{(1 - r^5)^2} , \\
& Y = \frac{2^{-1/16}}{g^{1/8}} \left(\frac{r}{1 - r^5}\right)^{1/8} , \quad k = -\frac{2^{1/4} L}{g^{3/2}} \left(\frac{r^5}{1 - r^5}\right)^{1/2} , \\
& X = r \, .
\end{aligned}
$$

- UV regime: locally AdS_7 with $X = 1$ and $\mathcal{F}_{(4)\,0123} = \mathcal{F}_{(4)\,3456} = 0$.
- IR regime: Generic singularity. We want to give the physical interpretation of this singularity!

$\mathrm{AdS}_7/\mathrm{CFT}_6$ in Massive IIA

- Massive type IIA with $\mathrm{AdS}_7 \times_w \tilde{S}^3$ vacuum $\rightarrow \mathcal{N} = 1$ minimal gauged supergravity in $d = 7$. [Apruzzi, Fazzi, Rosa, Tomasiello. 2013.], [Passias, Rota, Tomasiello. 2015.].
- Branes' intersection NS5-D6-D8. [Hanany, Zaffaroni. 1998.], [Imamura. 2001].
- Non-lagrangian theory arising as the fixed point of the 6d worldvolume QFT. [Hanany, Zaffaroni. 1998.].
- $\mathrm{AdS}_7 \times_w \tilde{S}^3$ "near-horizon" of NS5-D6-D8 with 16 supercharges. [Gaiotto, Tomasiello. 2014.], [Bobev, Dibitetto, Gautason, Truijen. 2016.]
- Dual to $\mathcal{N} = (1, 0)$ SCFT_6. [Gaiotto, Tomasiello. 2014.].

AdS_3 Slicing and its Massive IIA Interpretation

- We want to give an interpretation of our $d = 7$ charged flow as a defect in the $\mathcal{N} = (1, 0)$ SCFT_6.

$$ds_7^2 = e^{2U(r)} \left(ds^2_{\mathrm{AdS}_3} + ds^2_{S^3}\right) + e^{2V(r)}\, dr^2$$

- In the UV the solution is dual to the $\mathcal{N} = (1, 0)$ SCFT_6: it describes the near-horizon of NS5-D6-D8.
- What happens in the IR? The singular behavior and the dyonic profile of $\mathcal{F}_{(4)}$ in $d = 7$ hints the presence of D2 and D4-branes filling the AdS_3 and intersecting the bound state NS5-D6-D8!
- We need a new explicit solution in massive IIA supergravity describing a bound state D2-D4-NS5-D6-D8.

The Brane Picture: the Intersection

- First step: Solution describing NS5-D6-D8 depends on two functions $S(z, r)$ and $K(z, r)$ related to the D6 and NS5 on a background filled by D8 branes. [Imamura. 2001] $\rightarrow H_3$ and F_2 fluxes.
- Second step: Intersect NS5-D6-D8 with a D2-D4 bound state wrapping two coordinates of the worldvolume. $\rightarrow$ Dyonic F_4 flux!

branes	t	y	ρ	φ^1	φ^2	φ^3	z	r	θ^1	θ^2
NS5	×	×	×	×	×	×	–	–	–	–
D6	×	×	×	×	×	×	×	–	–	–
D8	×	×	×	×	×	×	–	×	×	×
D2	×	×	–	–	–	–	×	–	–	–
D4	×	×	–	–	–	–	–	×	×	×

The Brane Picture: Explicit Solution

- $S(r,z)$ and $K(r,z)$ $\to$ intersection NS5-D6-D8. [Imamura. 2001].
- "Non-standard" intersection with D2-D4 (see [Boonstra, Peeters, Skenderis. 1998.]).

$$\mathrm{d}s^2_{10} = S^{-1/2} H_{\mathrm{D2}}^{-1/2} H_{\mathrm{D4}}^{-1/2}\, \mathrm{d}s^2_{\mathbb{R}^{1,1}} + S^{-1/2} H_{\mathrm{D2}}^{1/2} H_{\mathrm{D4}}^{1/2} \left(\mathrm{d}\rho^2 + \rho^2\, \mathrm{d}s^2_{S^3}\right)$$

$$+ K\, S^{-1/2} H_{\mathrm{D2}}^{-1/2} H_{\mathrm{D4}}^{1/2}\, \mathrm{d}z^2 + K\, S^{1/2} H_{\mathrm{D2}}^{1/2} H_{\mathrm{D4}}^{-1/2} \left(\mathrm{d}r^2 + r^2\, \mathrm{d}s^2_{S^2}\right),$$

$$e^{\Phi} = g_s\, K^{1/2}\, S^{-3/4} H_{\mathrm{D2}}^{1/4} H_{\mathrm{D4}}^{-1/4},$$

$$H_3 = \frac{\partial}{\partial z}(K S)\, \mathrm{vol}_3 - dz \wedge \star_3\, \mathrm{d}K, \qquad F_0 = m, \qquad F_2 = -g_s^{-1} \star_3 \mathrm{d}S$$

$$F_{(4)} = g_s^{-1}\, \mathrm{vol}_{\mathbb{R}^{1,1}} \wedge dz \wedge \mathrm{d}H_{\mathrm{D2}}^{-1} + \star_{10}\left(\mathrm{vol}_{\mathbb{R}^{1,1}} \wedge \mathrm{vol}_3 \wedge \mathrm{d}H_{\mathrm{D4}}^{-1}\right),$$

where $\quad m g_s\, K - \frac{\partial S}{\partial z} = 0, \quad r^{-2}\, \partial_r(r^2 \partial_r\, S) + \frac{1}{2}\frac{\partial^2}{\partial z^2} S^2 = 0,$

$$H_{\mathrm{D2}}(\rho, r) = \left(1 + \frac{Q_{\mathrm{D4}}}{\rho^2}\right)\left(1 + \frac{Q_{\mathrm{D6}}}{r}\right), \quad H_{\mathrm{D4}}(\rho) = \left(1 + \frac{Q_{\mathrm{D4}}}{\rho^2}\right).$$

AdS_7 Regime and dual SCFT_6

- Take $\rho \to \infty$ (i.e. $H_{\mathrm{D4}} \to 1$ and $H_{\mathrm{D2}} \to H_{\mathrm{D6}}$) and $z, r \to \infty$ (while still keeping $\frac{r}{z^2}$ finite).
- Take $K \sim \frac{2}{z^3}\, G\left(\frac{r}{z^2}\right)$, and $S \sim \frac{1}{4r}\, W\left(\frac{r}{z^2}\right)$ for some suitable functions G and W. [Bobev, Dibitetto, Gautason, Truijen. 2016.]
- Perform the coordinate redefiniton

  (inspired by [Cvetic, Lu, Pope, Vazquez-Poritz. 2000.])

$$r^{1/2} = 6\,\frac{\sin\alpha}{\zeta}\,, \qquad z = \frac{\cos\alpha}{\zeta}\,.$$

- Choosing $W = 1$ and $G = \frac{1}{2}\cos^3\alpha$,

$$\mathrm{d}s^2_{10} \sim 2\cos\alpha\left(\tan\alpha\,\mathrm{d}s^2_{\mathrm{AdS}_7} + \tan\alpha\,\mathrm{d}\alpha^2 + \frac{1}{4}\sin^2\alpha\,\mathrm{d}s^2_{S^2}\right)\,.$$

$\longrightarrow \mathrm{AdS}_7 \times_w \tilde{S}^3$: dual description in terms of $\mathcal{N} = (1,0)$ SCFT_6.

AdS_3 **Regime and Defect** SCFT_2

- Take $z, r \to \infty$ (while still keeping $\frac{r}{z^2}$ finite).
- Send $\rho \to 0$.

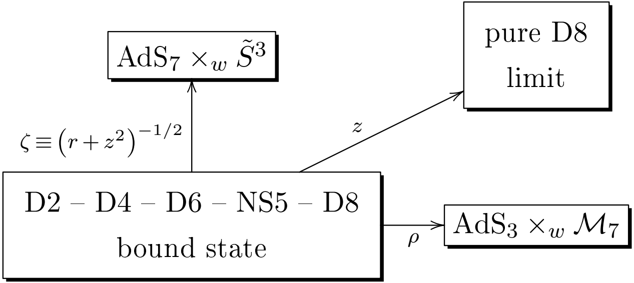
$$ds_7^2 \sim \zeta^{-1/4} \underbrace{\left(\frac{\rho^2}{Q_{\mathrm{D4}}} \mathrm{d}s^2_{\mathbb{R}^{1,1}} + \frac{Q_{\mathrm{D4}}}{\rho^2} d\rho^2 \right)}_{\mathrm{d}s^2_{\mathrm{AdS}_3}} + \frac{d\zeta^2}{\zeta^2} + Q_{\mathrm{D4}} \zeta^{-1/4} \mathrm{d}s^2_{S^3} \ ,$$

$\longrightarrow \mathrm{AdS}_3 \times_w \mathcal{M}_4$ with a 4-manifold $\mathcal{M}_4$ constructed as a fibration of S^3 over a segment.

- Dual description in terms of $\mathcal{N} = (4, 0)$ SCFT_2: Conformal defect within the SCFT_6!

Summary on D2-D4-NS5-D6-D8 Bound State

- The bound state D2-D4-NS5-D6-D8 realizes a surface defect SCFT_2 within the $\mathcal{N} = (1,0)$ SCFT_6.
- Three limits depending on a combination of the three coordinates (ρ, z, r), respectively yielding AdS_7, the asymptotic domain-wall behavior typical of massive type IIA solutions, and AdS_3.



Future Directions

- AdS_3 solutions and the origin of $d = 2$ SCFTs in massive IIA string theory. [Dibitetto, Lo Monaco, Passias, N.P., Tomasiello. Work in progress.].
- Defects in $\mathcal{N} = 2$ SCFT_5: AdS_3 solutions in $F(4)$ gauged supergravity in $d = 6$. [Dibitetto, N.P.. Work in progress.].
- D3-D5-NS5-D7 intersections and defects in type IIB and F-theory. [Dibitetto, N.P.. Work in progress.].
- Warped $d = 2$ SCFTs as holographic defects. [Deger, Dibitetto, N.P.. Work in progress.].

Conclusions

- We introduced minimal $\mathcal{N} = 1$ gauged supergravity in $d = 7$.
- We presented a new class of BPS flows involving a non-trivial profile for the 3-form gauge potential.
- We presented the uplift to the dyonic membrane in M-theory.
- We considered a particular BPS flow with an AdS_3 slicing and AdS_7 asymptotics and we presented its brane picture in massive IIA string theory in terms of a bound state D2-D4-NS5-D6-D8.
- We constructed the holographic interpretation of this bound state in terms of a defect $\mathcal{N} = (4, 0)$ SCFT_2 within the $\mathcal{N} = (1, 0)$ SCFT_6.