Motivations	Wig	$\mathcal{N}=$ 2, $\mathit{D}=$ 4 MESGT	Л
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Fermions, Wigs and Attractors

Lorenzo G.C. Gentile

Università di Padova & INFN

28 maggio 2014

Based on arXiv: 1309.8021 - 1403.5097

In collaboration with P.A. Grassi, A. Marrani, A. Mezzalira and W. Sabra

Motivations	Wig	$\mathcal{N}=2,~l$
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 $\mathcal{N} = 2, \ D = 5 \text{ MESG}$

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- AdS/CFT Correspondence
- The Attractor Mechanism
 - Example
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 - Killing Spinor
- 3 $\mathcal{N} = 2, D = 4$ Minimally Coupled MESGT
 - Special Kähler Geometry
 - Axion-Dilaton Model for DE-Black Holes
- N = 2 D = 5 Minimally Coupled MESGT
 Universal result for BPS Black Holes
 - Results and Open Issues

Motivations	Wig	$\mathcal{N}=2,\ D=4$!
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 $\mathcal{N} = 2, \ D = 5 \text{ MESG}^{-1}$

Final Results

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AdS/CFT Correspondence

A particular sector of AdS/CFT correspondence relates Einstein equations in d-dimensions to Navier-Stokes equations in (d-1)-dimensions.

Fluid-Gravity Corresponcence

• In general, AdS/CFT works for supergravity *i.e.* for a theory with fermionic dofs.

- New internal (Grassmannian) dots for the fluid
- New conserved charges
- New contributions to "classical" thermodynamic variables
- Extend the construction to all supergravity fields

New contributions to DN conserved charges (?) New solutions-generating technique for supergravit

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Final Results

Attractor mechanism

For an extremal BH in matter-coupled supergravities

In approaching the Event Horizon, the moduli completely lose memory of the initial data, and take values dependent only on the electric/magnetic charges of the BH:

$$z^{i}\Big|_{\text{horizon}} = z^{i}(Q, P)$$

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 $\mathcal{N} = 2, \ D = 5 \text{ MESG}$

Attractor mechanism

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 $\mathcal{N} = 2, \ D = 5 \text{ MESG}^2$

Attractor mechanism

For an extremal BH in matter-coupled supergravities

In approaching the Event Horizon, the moduli completely lose memory of the initial data, and take values dependent only on the electric/magnetic charges of the BH:

$$\left. z^{i} \right|_{\text{horizon}} = z^{i} \left(Q, P \right)$$



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Regardless of the initial conditions, the Horizon values depend ONLY on the charges, but nevertheless the evolution remains DETERMINISTIC!

Motivations	Wig	$\mathcal{N}=$ 2, $D=$ 4 MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final Re
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 $\mathcal{N} = 2, D = 4$ Axion-Dilaton-Einstein-Maxwell Sugra coupled to a gauge multiplet: { $g_{\mu\nu}, A_{\mu}$; A'_{μ}, ϕ }

$$S = \int d^{4}x \sqrt{-g} \left[\frac{R}{2} - 2\partial^{\mu}\phi \partial_{\mu}\phi - \frac{1}{2}e^{-2\phi} \left(\frac{F^{\mu\nu}F_{\mu\nu}}{F_{\mu\nu}} + F^{'\mu\nu}F_{\mu\nu}' \right) \right]$$

Electric and magnetic charge can be chosen to set axion to zero, then

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Motivations	Wig	$\mathcal{N}=2, \ D=4$ MESGT	$\mathcal{N}=2, \ D=5 \text{ MESGT}$
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 $\mathcal{N} = 2, D = 4$ Axion-Dilaton-Einstein-Maxwell Sugra coupled to a gauge multiplet: { $g_{\mu\nu}, A_{\mu}$; A'_{μ}, ϕ }

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Electric and magnetic charge can be chosen to set axion to zero, then

$$\Rightarrow ds^{2} = -e^{2U(r)}dt^{2} + e^{-2U(r)}\left[dr^{2} + r^{2}\left(d\theta^{2} + \sin^{2}\theta d\varphi^{2}\right)\right]$$

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Motivations	Wig	$\mathcal{N} = 2, \ D = 4 \text{ MESGT}$	$\mathcal{N}=2, \ D=5 \text{ MESGT}$
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...computations...

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Motivations	Wig	$\mathcal{N} = 2, \ D = 4 \text{ MESGT}$	$\mathcal{N}=2, \ D=5$ MESGT
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 $\mathcal{N} = 2, D = 4$ Axion-Dilaton-Einstein-Maxwell Sugra coupled to a gauge multiplet: { $g_{\mu\nu}, A_{\mu}$; A'_{μ}, ϕ }

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Electric and magnetic charge can be chosen to set axion to zero, then

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...computations...

$$\Rightarrow e^{-2U(r)} = H_1 H_2 \qquad e^{-2\phi(r)} = H_1 / H_2$$
$$H_1 = e^{-\phi_0} + \frac{|q|}{4\pi r} \qquad H_2 = e^{\phi_0} + \frac{|p'|}{4\pi r}$$

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Motivations	Wig	$\mathcal{N}=2, D=4$ MESGT	$\mathcal{N}=2, \ D=5 \ \text{MESGT}$
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 $\mathcal{N} = 2, D = 4$ Axion-Dilaton-Einstein-Maxwell Sugra coupled to a gauge multiplet: { $g_{\mu\nu}, A_{\mu}$; A'_{μ}, ϕ }

$$S = \int d^{4}x \sqrt{-g} \left[\frac{R}{2} - 2\partial^{\mu}\phi \partial_{\mu}\phi - \frac{1}{2}e^{-2\phi} \left(\frac{F^{\mu\nu}F_{\mu\nu}}{F^{\mu\nu}} + F^{\prime\mu\nu}F^{\prime}_{\mu\nu} \right) \right]$$

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$$\Rightarrow \left. e^{-2\phi} \right|_{\mathrm{hor}} = \left| rac{q}{p'} \right|$$

Fermions, Wigs and Attractors

Motivations	Wig	$\mathcal{N}=$ 2, $D=$ 4 MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final Resu
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When you compute the finite variation of a field under a symmetry what you actually compute is

Motivations	Wig	$\mathcal{N}=$ 2, $D=$ 4 MESGT	$\mathcal{N}=2, \ D=5 \ MESGT$	Final Result
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When you compute the finite variation of a field under a symmetry what you actually compute is

$$\Phi = e^{\delta}\phi = \phi + \delta\phi + \frac{1}{2}\delta^2\phi + \frac{1}{3!}\delta^3\phi + \dots$$

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Motivations	Wig	$\mathcal{N}=2, \ D=4$ MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final Result
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When you compute the finite variation of a field under a symmetry what you actually compute is

$$\Phi = e^{\delta}\phi = \phi + \delta\phi + \frac{1}{2}\delta^2\phi + \frac{1}{3!}\delta^3\phi + \dots$$

Dealing with Grassmannian variables once you soak out the fermionic dofs the series automatically truncates!

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Motivations	Wig	$\mathcal{N}=2,~D=4~MESGT$	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final Result
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When you compute the finite variation of a field under a symmetry what you actually compute is

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Dealing with Grassmannian variables once you soak out the fermionic dofs the series automatically truncates!

The Wig is the complete non-linear supergravity solution built from a purely bosonic background.

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Motivations	Wig	$\mathcal{N}=2, \ D=4$ MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final Result
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When you compute the finite variation of a field under a symmetry what you actually compute is

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Dealing with Grassmannian variables once you soak out the fermionic dofs the series automatically truncates!

The Wig is the complete non-linear supergravity solution built from a purely bosonic background.

Note that as susy parameters we use the "anti-Killing spinors" .

Motivations	Wig	$\mathcal{N}=$ 2, $D=$ 4 MESGT	$\mathcal{N}=2, \ D=5 \ \text{MESGT}$	Final Re
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Space are endorsed with both isometries and superisometries, the latter generated by Killing spinors:

Computation of the Killing Spinor ε:

$$\left(\partial_{M} + \frac{1}{4} \; \phi_{M}^{AB} |_{maxy} \; \nabla_{AB} + \frac{\Lambda}{2} \; \phi_{M}^{A} |_{maxy} \; \nabla_{A} \right) \epsilon = 0$$

• ϵ : For example in $AdS_3 \ge \mathbb{C}$ fermionic components $\longrightarrow 4$ real dof's

• Turning on BH: $\delta_{\epsilon}\psi = \mathcal{D}^{\mathrm{bh}}\epsilon_{\mathrm{empty}} \neq 0$

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Motivations	Wig	$\mathcal{N}=$ 2, $D=$ 4 MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final Res
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$$\left(\partial_{M} + \frac{1}{4} \hat{\omega}_{M}^{AB}|_{\text{empty}} \Gamma_{AB} + \frac{\Lambda}{2} e_{M}^{A}|_{\text{empty}} \Gamma_{A}\right) \epsilon = 0$$

• ϵ : For example in AdS_3 2 $\mathbb C$ fermionic components \longrightarrow 4 real dof's

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Motivations	Wig	$\mathcal{N}=$ 2, $D=$ 4 MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final Res
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Space are endorsed with both isometries and superisometries, the latter generated by Killing spinors:

Computation of the Killing Spinor ε:

$$\left(\partial_{M} + \frac{1}{4} \hat{\omega}_{M}^{AB}|_{\text{empty}} \Gamma_{AB} + \frac{\Lambda}{2} e_{M}^{A}|_{\text{empty}} \Gamma_{A}\right) \epsilon = 0$$

€: For example in AdS₃ 2 C fermionic components → 4 real dof's

• Turning on BH: $\delta_{\epsilon}\psi = \mathcal{D}^{\mathrm{bh}}\epsilon_{\mathrm{empty}} \neq 0$

Motivations	Wig	$\mathcal{N}=2,~D=4~\text{MESGT}$	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final Res
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Motivations	Wig	$\mathcal{N}=$ 2, $D=$ 4 MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final Res
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The black hole has (partially) broken the superisometries

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Motivations	Wig	$\mathcal{N}=$ 2, $D=$ 4 MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final Res
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Killing Spinor

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The black hole has (partially) broken the superisometries!

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Motivations	Wig	$\mathcal{N}=$ 2, $D=$ 4 MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final Res
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The black hole has (partially) broken the superisometries!

Motivations	Wig	$\mathcal{N}=2, \ D=4$ MESGT	$\mathcal{N}=2,~D=5~{\sf MESGT}$	Final F
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Fermionic bilinears —> series truncates!

Development of algorithms to compute, order by order (Wig)

Implementation of algorithms in Mathematica code

LGCG, P. A. Grassi and A. Mezzalira - hep-th/1207.0686

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Motivations	Wig	$\mathcal{N}=$ 2, $D=$ 4 MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final R
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Motivations	Wig	$\mathcal{N}=$ 2, $D=$ 4 MESGT	$\mathcal{N}=2,~D=5~\mathrm{MESGT}$	Final F
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- Fermionic bilinears —> series truncates!
- Development of algorithms to compute, order by order (Wig)

$$\left\{\psi_{M}\;,\; e^{A}_{M}\;,\; A_{M}\;,\; \hat{\omega}^{AB}_{M}
ight\}$$

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Motivations	Wig	$\mathcal{N}=$ 2, $D=$ 4 MESGT	$\mathcal{N}=2,~D=5~\mathrm{MESGT}$	Final F
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- Fermionic bilinears —> series truncates!
- Development of algorithms to compute, order by order (Wig)

$$\left\{\psi_{\mathcal{M}}, \ \boldsymbol{e}_{\mathcal{M}}^{\mathcal{A}}, \ \boldsymbol{A}_{\mathcal{M}}, \ \hat{\omega}_{\mathcal{M}}^{\mathcal{A}\mathcal{B}}\right\}$$

Implementation of algorithms in Mathematica code

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Motivations	Wig	$\mathcal{N}=$ 2, $D=$ 4 MESGT	$\mathcal{N}=2,~D=5~\mathrm{MESGT}$	Final F
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- Fermionic bilinears —> series truncates!
- Development of algorithms to compute, order by order (Wig)

$$\left\{\psi_{M}, e_{M}^{A}, A_{M}, \hat{\omega}_{M}^{AB}\right\}$$

• Implementation of algorithms in Mathematica code

LGCG, P. A. Grassi and A. Mezzalira - hep-th/1207.0686

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$$\begin{split} \delta \boldsymbol{e}^{a}_{\mu} &= -i \bar{\psi}_{A\,\mu} \gamma^{a} \boldsymbol{\epsilon}^{A} + \mathrm{h.c.} \;, \\ \delta \boldsymbol{A}^{\Lambda}_{\mu} &= 2 \bar{L}^{\Lambda} \bar{\psi}_{A\,\mu} \boldsymbol{\epsilon}_{B} \boldsymbol{\varepsilon}^{AB} + i \boldsymbol{f}^{\Lambda}_{i} \bar{\lambda}^{i\,A} \gamma_{\mu} \boldsymbol{\epsilon}^{B} \boldsymbol{\varepsilon}_{AB} + \mathrm{h.c.} \;, \\ \delta \boldsymbol{z}^{i} &= \bar{\lambda}^{i\,A} \boldsymbol{\epsilon}_{A} \;, \end{split}$$

$$\begin{split} \delta\psi_{A\,\mu} = & \nabla_{\mu}\epsilon_{A} + \varepsilon_{AB}T^{-}_{\mu\nu}\gamma^{\nu}\epsilon^{B} + \text{stuff...} , \\ \delta\lambda^{i\,A} = & G^{i-}_{\mu\nu}\gamma^{\mu\nu}\epsilon_{B}\epsilon^{AB} + \text{other stuff...} , \end{split}$$

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$$\begin{split} \delta \pmb{e}^{A}_{\mu} &= -i \bar{\psi}_{A\,\mu} \gamma^{a} \epsilon^{A} + \mathrm{h.c.} \;, \\ \delta A^{\Lambda}_{\mu} &= 2 \bar{L}^{\Lambda} \bar{\psi}_{A\,\mu} \epsilon_{B} \epsilon^{AB} + i f^{\Lambda}_{i} \bar{\lambda}^{i\,A} \gamma_{\mu} \epsilon^{B} \epsilon_{AB} + \mathrm{h.c.} \;, \\ \delta z^{i} &= \bar{\lambda}^{i\,A} \epsilon_{A} \;, \end{split}$$

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Where

$$G^{i-}_{\mu
u} = -g^{iar{j}}ar{f}^{\Gamma}_{j}\,({
m Im}{\cal N})_{\Gamma\Lambda}\, ilde{F}^{\Lambda-}_{\mu
u}$$

Motivations	Wig	$\mathcal{N}=$ 2, $D=$ 4 MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final Results
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Scalar (complex) fields coordinatize a complex Kähler manifold

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Motivations	Wig	$\mathcal{N}=2, D=4$ MESGT	$\mathcal{N}=2, \ D=5 \text{ MESGT}$	Final Results
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Scalar (complex) fields coordinatize a complex Kähler manifold

Hermitian
$$g_{i\bar{j}}$$
 \longrightarrow $d\Omega = -2id\left(g_{i\bar{j}}dz^i \wedge d\bar{z}^{\bar{j}}\right) = 0$ \longrightarrow Kähler

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Motivations	Wig	$\mathcal{N}=$ 2, $D=$ 4 MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final Results
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The manifold is also special since there exist a C_{ijk} satisfying

$$R_{ar{i}ar{j}ar{l}k} = -g_{ar{j}ar{l}}g_{kar{i}} - g_{kar{l}}g_{ar{j}ar{i}} + g^{tar{ extstyle}}ar{\mathcal{C}}_{ar{i}ar{l}ar{ extstyle}}\mathcal{C}_{tkj}$$

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Motivations	Wig	$\mathcal{N}=$ 2, $\mathit{D}=$ 4 MESGT	$\mathcal{N}=2, \ D=5$ MESGT	Final Results
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Scalar (complex) fields coordinatize a complex Kähler manifold

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The manifold is also special since there exist a C_{ijk} satisfying

$$m{R}_{ar{l}jar{l}k}=-g_{ar{l}ar{l}}g_{kar{l}}-g_{kar{l}}g_{ar{l}ar{l}}+g^{tar{s}}ar{C}_{ar{l}ar{l}ar{s}}C_{tkj}$$

What you have to keep in mind:

$$(\mathrm{Im}\mathcal{N})_{\Gamma\Lambda} f_i^{\Lambda} L^{\Gamma} = 0$$

$$(\mathrm{Im}\mathcal{N})_{\Gamma\Lambda} f_i^{\Lambda} \bar{L}^{\Gamma} \neq 0$$

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wouvalions wig	$\mathcal{N} = 2, D = 4 \text{ MESGI}$	$\mathcal{N} = 2, D = 5 \text{ MESGI}$	Fina
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In this model

$$\mathcal{K} = -\ln \left[2\left(z + \bar{z}\right)\right]$$
 $\mathcal{N}_{\Gamma\Lambda} = -i \operatorname{diag}\left(z, 1/z\right)$

At zeroth order, you get (Attractor Mechanism!)

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Motivations	Wig	$\mathcal{N}=2, D=4$ MESGT	$\mathcal{N}=2, \ D=5 \ \text{MESGT}$	F
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At zeroth order, you get (Attractor Mechanism!)

$$z^{(0)} = \frac{q_0 - ip^1}{q_1 - ip^0}$$

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Motivations	Wig	$\mathcal{N}=2, \ D=4$ MESGT	$\mathcal{N}=2, D=5$ MESGT
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At zeroth order, you get (Attractor Mechanism!)

$$z^{(0)} = \frac{q_0 - ip^1}{q_1 - ip^0}$$

but at fourth order the ids. in the precedent slide implies...

$$\delta^{(4)} z = \frac{M^4}{(M+r)^4} \frac{p^0 q_0 - p^1 q_1}{(p^0 + iq_1)^2 (p^0 - iq_1) (q_0 + ip^1)} \mathcal{Q} \sin^2 \phi \sin^2 \theta$$

(...not so attractive, is it?).

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Motivations	Wig	$\mathcal{N}=2, \ D=4$ MESGT	$\mathcal{N}=2, D=5$ MESGT
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(...not so attractive, is it?). Note that a purely electric (magnetic) configuration

leaves the scalar field unchanged.

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Motivations	Wig	$\mathcal{N}=$ 2, $\mathit{D}=$ 4 MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT
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$\mathcal{N} = 2 D = 5$ Minimally Coupled MESGT

Field Content



 e^a_μ A^l_μ ϕ^i



 $\psi^i_\mu \quad \lambda^{\rm xi}$





Motivations	Wig	$\mathcal{N}=2, \ D=4$ MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final Results
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Using the two ids of Real Geometry we get

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Motivations	Wig	$\mathcal{N}=2,~D=4~MESGT$	$\mathcal{N}=$ 2, $\mathit{D}=$ 5 MESGT	Final Results
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Using the two ids of Real Geometry we get

$$\delta^{(4)}\phi^{x} = \mathcal{A}^{\mu}\partial_{\mu}\phi^{x} + \mathcal{B}^{\mu\nu}h_{lx}F^{l}_{\mu\nu} + \{\ldots\} = 0$$

where ${\cal A}$ and ${\cal B}$ are cumbersome expressions and $\{\ldots\}$ are terms which goes to zero on the chosen background.

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Motivations	Wig	$\mathcal{N}=2,~D=4~MESGT$	$\mathcal{N}=$ 2, $\mathit{D}=$ 5 MESGT	Final Results
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So in 5D the Attractor Mechanism is really attractive! Ok but... Why?

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Motivations	Wig	$\mathcal{N}=2,~D=4~MESGT$	$\mathcal{N}=$ 2, $\mathit{D}=$ 5 MESGT	Final Results
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where ${\cal A}$ and ${\cal B}$ are cumbersome expressions and $\{\ldots\}$ are terms which goes to zero on the chosen background.

So in 5D the Attractor Mechanism is really attractive! Ok but... Why?

The Attractor Mechanism is sensitive to the dyonicity of the solution.

In 5D no dyonic solutions are present so, the AM is unchanged at all orders.

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Motivations	Wig	$\mathcal{N}=2, \ D=4$ MESGT	$\mathcal{N}=2, \ D=5 \ \text{MESGT}$	Final Results
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The wig generates fermionic corrections (in the forms of bilinears) to bosonic objects, such as the metric and the gauge field. What are them?

- No classical counterpart
- Generated through supersymmetry

- Quantize the fermionic zero mode.
- Compute quantistic vev for the various operator

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Motivations	Wig	$\mathcal{N}=2, \ D=4$ MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final Results
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Motivations	Wig	$\mathcal{N}=2, \ D=4$ MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT	Final Results
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But: very difficult for gravity! Use monopoles instead

(work in progress . . .)

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Motivations	Wig
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\mathcal{N}	2,	D	4	MESGT
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 $\mathcal{N} = 2, \ D = 5 \text{ MESG}$

Results and Open Issues

Wig computation

• Dual Fluid: no dissipative corrections \oplus presence of ne

Analysis of Energy Momentum Tensor

1209.4100 - 1302.5060

• Wigs for AdS_3 , AdS_4 and AdS_5 BH

1207.0686 - 1209.4100

Other models

• AdS_5 : 1st order correction to Euler equations \oplus Fermionic Corrections to AdS_3 dual Fluid

1105.4706 - 1302.5060

- Modification of AM in $\mathcal{N} = 2 D = 4$
- Modification of AM in $\mathcal{N} = 2 D = 5$

1309.0821 - 1403.5097

Minimally coupled Sugra



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Susy Fluid-dynamics

Motivations	Wig	
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00		

 $\mathcal{N} = 2, \ D = 4 \text{ MESGT}$

 $\mathcal{N} = 2, \ D = 5 \text{ MESG}$

Results and Open Issues

Wig computation

 $\bullet\,$ Dual Fluid: no dissipative corrections $\oplus\,$ presence of new dof

Analysis of Energy Momentum Tensor

1209.4100 - 1302.5060

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1207.0686 - 1209.4100

Other models

Susy

Fluid-dynamics

 AdS₅: 1st order correction to Euler equations ⊕ Fermionic Corrections to AdS₃ dual Fluid

1105.4706 - 1302.5060

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1309.0821 - 1403.5097

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Minimally coupled Sugra



Motivations	Wig	$\mathcal{N}=$ 2, $D=$ 4 MESGT	$\mathcal{N}=$ 2, $\mathit{D}=$ 5 MESGT
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1309.0821 - 1403.5097

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• To Do:

Susy Fluid-dynamics

Motivations	Wig	$\mathcal{N}=$ 2, $\mathit{D}=$ 4 MESGT	$\mathcal{N}=$ 2, $\mathit{D}=$ 5 MESGT
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Susy Fluid-dynamics
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1309.0821 - 1403.5097

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Motivations	Wig	$\mathcal{N}=$ 2, $\mathit{D}=$ 4 MESGT	$\mathcal{N}=2, \ D=5$ MESGT
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Fermions, Wigs and Attractors

1309.0821 - 1403.5097



Motivations	Wig	$\mathcal{N}=$ 2, $\mathit{D}=$ 4 MESGT	$\mathcal{N}=$ 2, $\mathit{D}=$ 5 MESGT
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Minimally coupled Sugra

• To Do:

Motivations	Wig	$\mathcal{N}=$ 2, $\mathit{D}=$ 4 MESGT	$\mathcal{N}=$ 2, $\mathit{D}=$ 5 MESGT
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• To Do:

- "Twin wigs" (wigs of twin-supergravities)
- Wigs of Monopoles in $\mathcal{N} = 2$ SYM and intepretation

Minimally coupled Sugra

Fermions, Wigs and Attractors

Motivations	Wig	$\mathcal{N}=2, \ D=4$ MESGT	$\mathcal{N}=$ 2, $D=$ 5 MESGT
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Wig computation

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Minimally

coupled Sugra

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Susy Fluid-dynamics

Fermions, Wigs and Attractors

Motivations	Wig	$\mathcal{N}=$ 2, $\mathit{D}=$ 4 MESGT	$\mathcal{N}=$ 2, $\mathit{D}=$ 5 MESGT
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