

Title: Kinematic Space

Date: Jul 22, 2016 02:30 PM

URL: <http://pirsa.org/16070072>

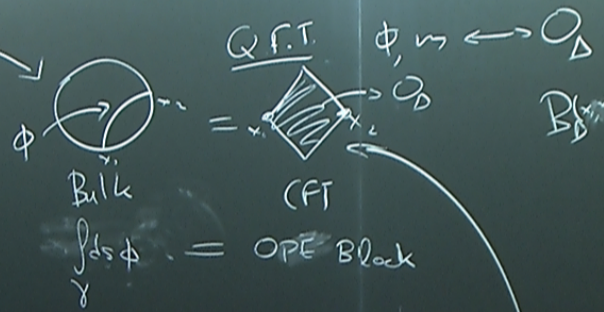
Abstract:

Asympt. AdS_3

GEOMETRY
Sant = $\frac{L(x)}{4G}$

(time-slice)

$$ds^2 = \frac{\delta^2 L(x_1, x_2)}{\partial x_1^\mu \partial x_2^\nu} dx_1^\mu dx_2^\nu$$

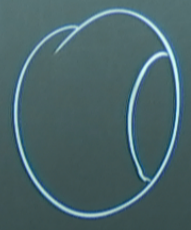
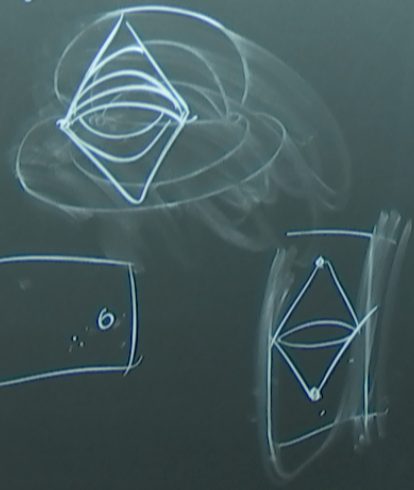


$$\frac{\langle O_\Delta(x_1) O_\Delta(x_2) \tilde{O}(x) \rangle}{\langle O_\Delta(x_1) O_\Delta(x_2) \rangle}$$

$$O_\Delta(x_1) O_\Delta(x_2) = \sum_\Delta c_{\Delta \Delta \Delta} \left(1 + \binom{b}{1} \partial + \binom{b}{2} \partial^2 + \dots \right) O_\Delta(x_1)$$

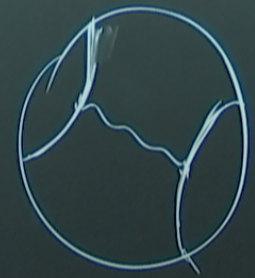
$$\frac{\langle \phi_B(x_1) \tilde{\phi}(x) \rangle}{\langle \phi(x_1) \phi_B(x_2) \rangle}$$

Higher D



ψ_{HULL}

$$\langle B_D \cdot B_D \rangle$$



Ⓐ 1509.00113 — Ⓑ 1506.03307

FOCUS CFT_d

AND

SPHERES

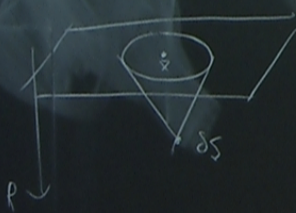
(◇)

QO:

$$\boxed{\delta S} = \delta \langle H \rangle + \mathcal{O}(\delta g)^2$$

$H \sim$

$$\int_{B(R, \vec{x})} d^{d-1} \vec{x}' \frac{R^2 - (\vec{x} - \vec{x}')^2}{R} T_{00}$$



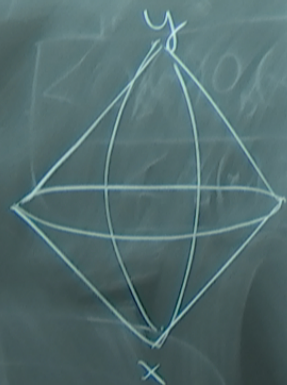
$$(\square_{dS_d} - m^2) \delta S = 0, \quad m^2 L^2 = -1$$

$$\partial_{S_d} \delta S_d = \frac{1^2 (-dR^2 + d\vec{x}^2)}{R^2}$$

$SS \leftrightarrow$

? $\leftrightarrow$

T_{bt}
GENERIC PRIMARY.



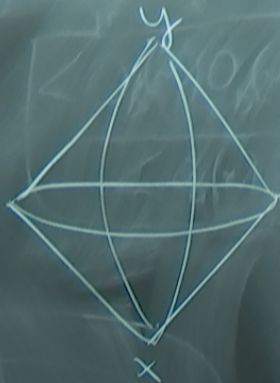
$$SS. \sim \int_{CAUCHY} dN^M k^V \langle T_M \rangle \sim \int_{\diamond} d^d \zeta \frac{k^M k^V}{|k|^2} \langle T_M \rangle$$

$$Q[O_{m_1, \dots, m_L}] = \int_{\diamond} d^d \zeta |k|^{\Delta-L-d} k^{m_1} \dots k^{m_L} \langle O_{m_1, m_2, \dots, m_L} \rangle$$

SS $\leftrightarrow$

? $\leftrightarrow$

T_{bt}
GENERIC PRIMARIES.



$$\text{SS.} \sim \int_{\text{CAUCHY}} dN^M K^V \langle T_M \rangle \sim \int_{\diamond} d^d \zeta \frac{K^M K^V}{|K|^2} \langle T_M \rangle$$

$$\boxed{Q[O_{m_1 \dots m_L}]} = \int_{\diamond} d^d \zeta |K|^{\Delta-L-d} K^{m_1} \dots K^{m_L} \langle O_{m_1 m_2 \dots m_L} \rangle$$

$$\phi \sim 0 \quad \square_{\text{AdS}_{d+1}} \phi - m^2 \phi = 0.$$

$$Q \sim \int_{\text{RT}} d^{d+1} \alpha \sim \int_{\text{CW}} d^{d+1} x \sqrt{-g} \phi$$

$$M_{\square} = \frac{SO(2, d)}{SO(1, d-1) \times SO(1, 1)}$$

$$ds^2_{M_{\square}} = \frac{4L^2}{(x-y)^2} \left(-\eta_{\mu\nu} + \frac{2(x_{\mu}-y_{\mu})(x_{\nu}-y_{\nu})}{(x-y)^2} \right) dx^{\mu} dy^{\nu}$$

$\rightarrow (d, d)$

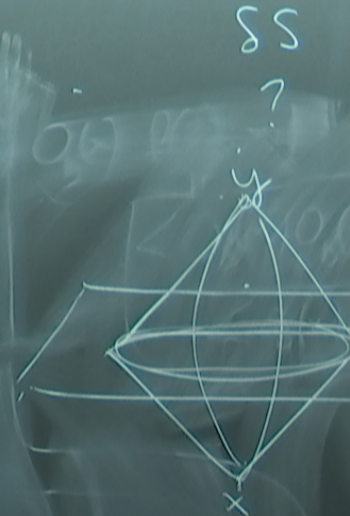
$$\sim \frac{\partial^2 \left[\log(-(x-y)^2) \right]}{\partial x^{\mu} \partial y^{\nu}} dx^{\mu} dy^{\nu}$$

$d=2$

$$M_{\square} = \boxed{dS_2} \times dS_2$$

$$S_{EE} = \boxed{S_L[\langle T \rangle]} + S_R[\langle \bar{T} \rangle]$$

$$\delta^2 \frac{\partial^2}{\partial u \partial v} S_L = \frac{c}{6} \exp\left(-\frac{12}{c} S_L\right)$$



1604.02687

↳ $\mathcal{K}$ for specific CFT_2 states beyond the vac

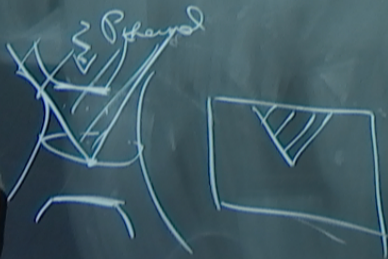
* thermal CFT_2 on cgl tors $\sim$ BTZ black hole

1) $ds^2 = du \bar{u} S du \bar{u}$

2) $\int_{\text{thermal}} T_{00} = H_{\text{mod}}$

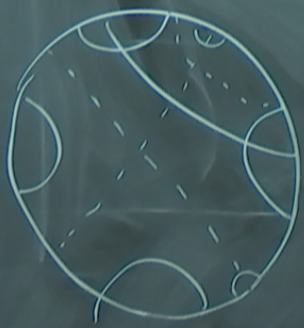
$\mathcal{K}_{\text{thermal}}$ hyperbolic patch of dS_2

* constant

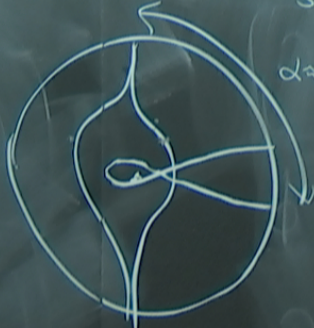


KS for Quotients of AdS_3 e.g. BTZ BH conical sing.

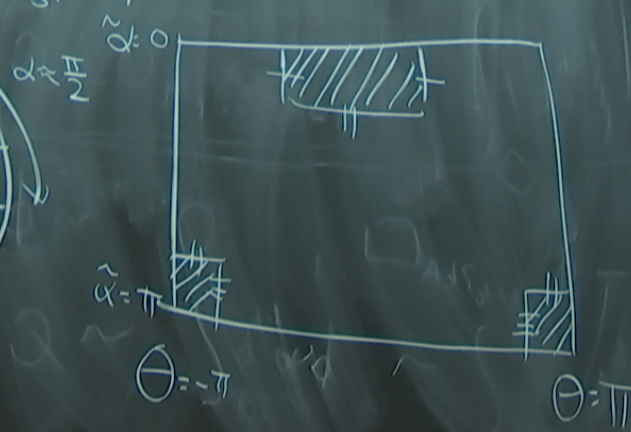
- Causally 'well-behaved'? ✓
- Phase transitions $AdS_3/\mathbb{Z}_n$ ✓



Covering Spac



$AdS_3/\mathbb{Z}_4$



Extensions

- 1) Tensor
- 2) Virasoro
- 3) ---

Einstein Eqs

$$S = A + S_{\text{bulk}}$$

Entanglement
Equations

$$\delta S = \delta \langle H_{\text{mod}} \rangle$$

$$\text{AdS}_{d+1}$$

$$(\square_{\text{AdS}} + d) H_{\text{mod}} = 0$$

$$\delta S = \delta \langle H_{\text{mod}} \rangle$$

$$(\square_{ds} + d) H_{\text{mod}} = 0$$

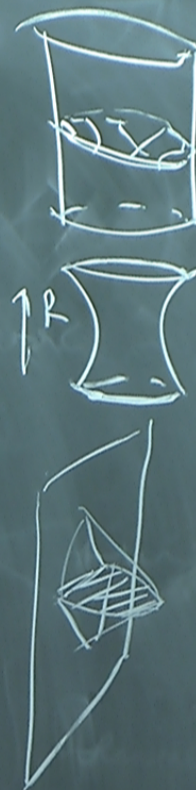
$$H_{\text{mod}} = \delta A + H_{\text{mod}}^{\text{bulk}}$$

$$(\square_{ds} + d) \delta A = \int_{\text{surface}} \delta G_{00}$$

$$H_{\text{mod}}^{\text{bulk}}$$

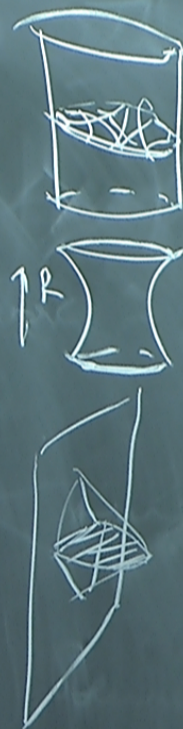
$$AdS_{d+1}$$

$$dS_d$$



$$A dS_{d+1}$$

$$dS_d$$



$$= 0$$

$$+ H_{mod}$$

$$\int_{\text{surface}} \delta G_{00}$$

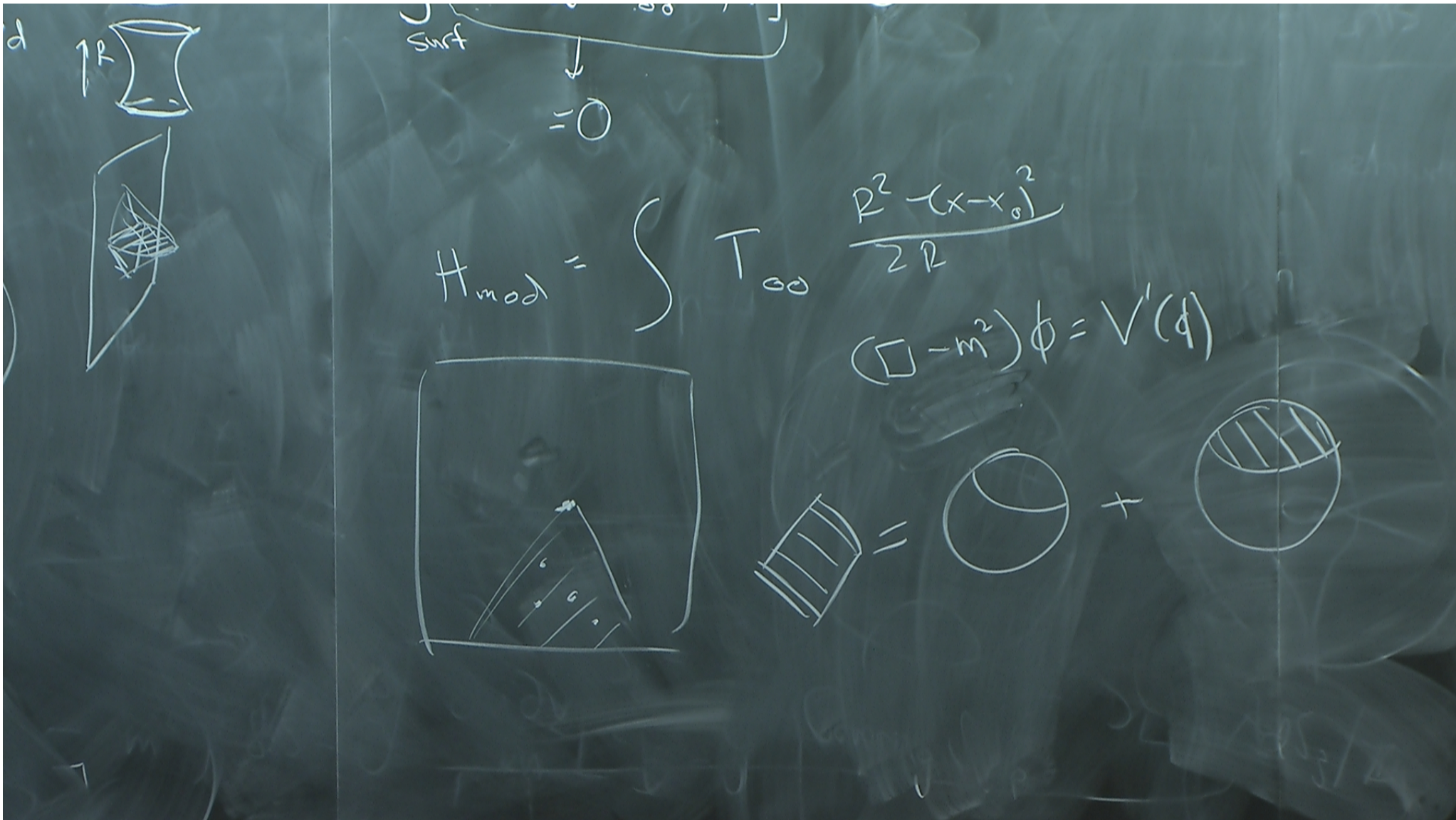
$$= \int_{\text{surf}} \delta T_{00}$$

$$\int_{\text{surf}} \delta [G_{00} - T_{00} - \Lambda] = 0$$

$$\downarrow$$

$$= 0$$

$$H_{mod} = \int T_{00} \frac{R^2 - (x - x_0)^2}{2R}$$



$$O_i(y) = \sum_k^{\text{global}} C_{ijk}(x) \left(\langle O_i(x) O_j(y) \tilde{O}(z) \rangle O_h(z) d^{\sigma} z \right)$$

$$(1 + \partial_x^2 + \partial_y^2 + \dots) O_k(y)$$

$$\tilde{\Delta} = d - \Delta_k$$

$$B_k$$

$$B_T = H_{\text{mod}}$$

$$k' < 0$$

dS
(d-1,1)

$(1 + \frac{|x-y|}{\sqrt{|x-y|^2}} \dots) O_z(y)$

$O_i(x) O_j(y) = \sum_k^{global} C_{ijk} \int \langle O_i(x) O_j(y) \tilde{O}(z) \rangle O_k^{\mu\nu}(z) dz$

$\tilde{\Delta} = \Delta - \Delta_k$

B_k

$B_0^{vir} =$

$\int F[\langle T \rangle] O$

$+ \int F'[\langle T \rangle] \delta T O$

$+ \dots$

$B_0^{vir} = B_0 + \frac{1}{c} B_{T0} + \frac{1}{c^2} T^2 O + \dots$

$T = \underbrace{\langle T \rangle}_c + \underbrace{\delta T}_{\sqrt{c}}$

ions

or

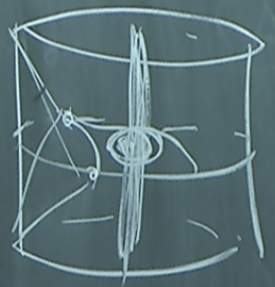
oro

n Eqs

Entanglement
Equations

$$B_{Vir}^{Vir}(x,y) = \int \langle \psi | \partial \hat{O}_R | \psi \rangle \partial_R$$

$$\int \phi_k$$



$$AdS_{d+1} \int dS_d$$

