Title: Energy transport for thick holographic branes

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Series: Quantum Fields and Strings

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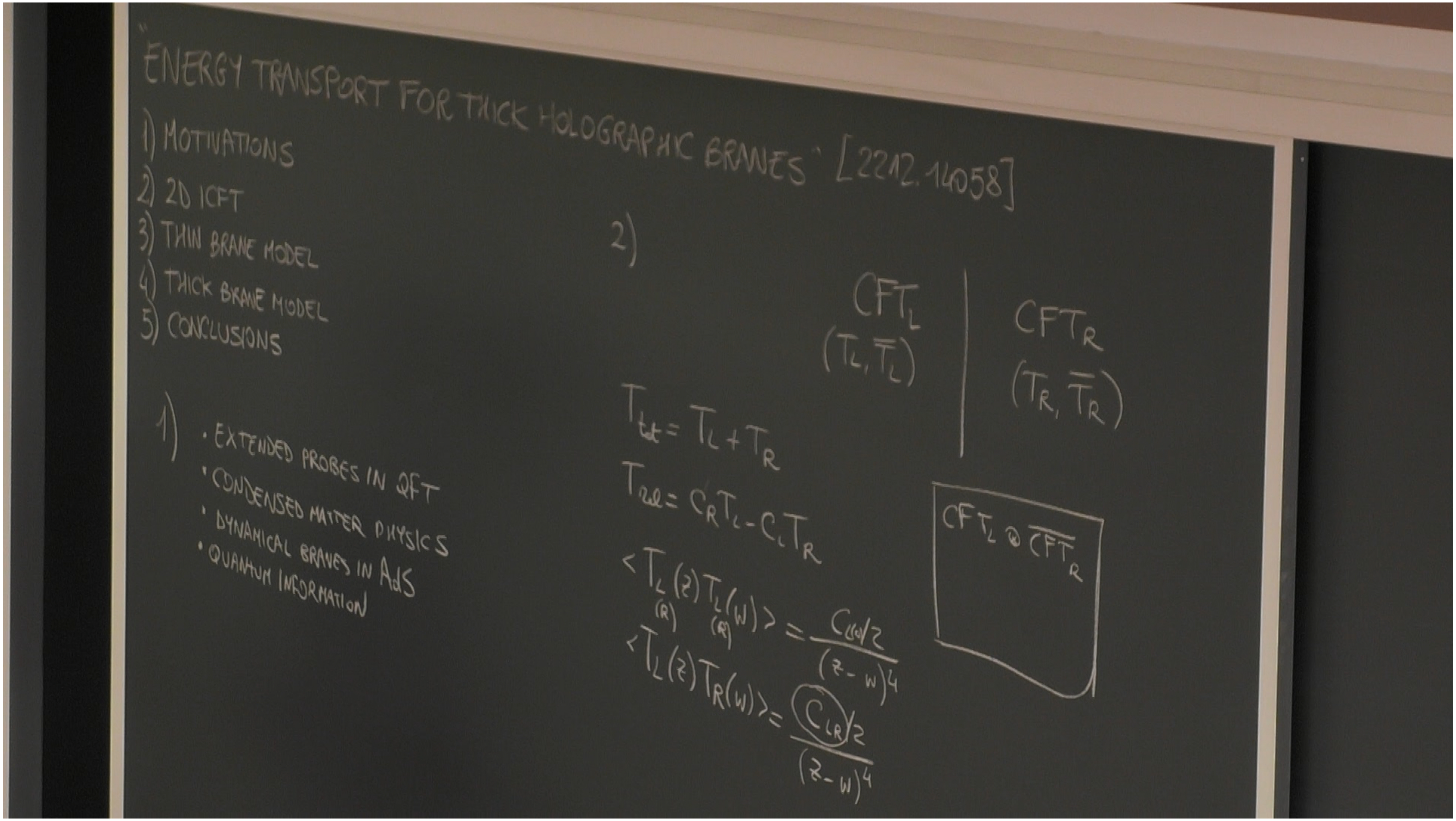
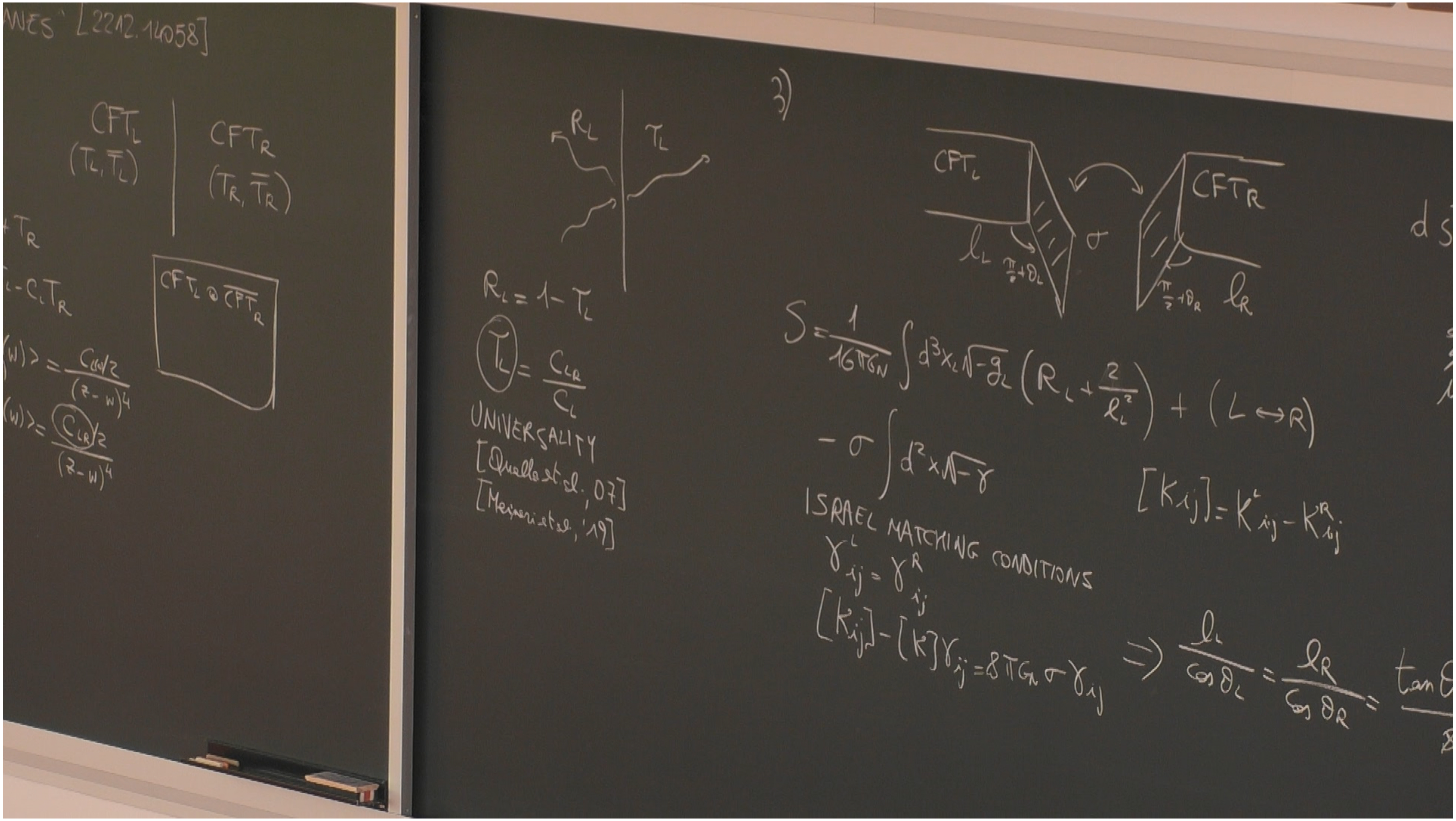
Abstract: Universal properties of two-dimensional conformal interfaces are encoded by the flux of energy transmitted and reflected during a scattering process.

In this talk, I will develop a method that allows me to extend previous results based on thin-brane holographic models to smooth domain-wall solutions of 3-dimensional gravity.

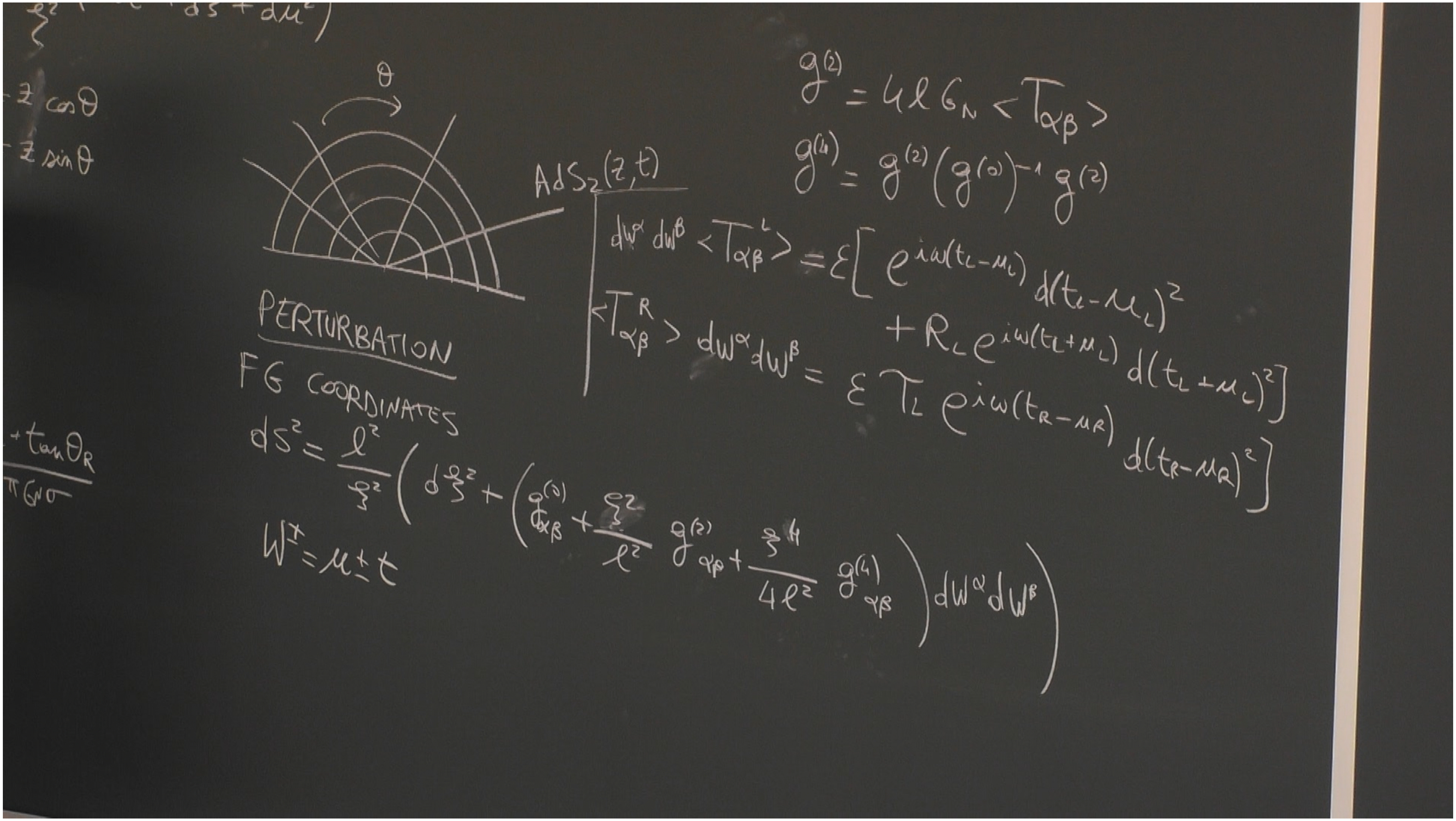
As an application, I will compute the transmission coefficient of a Janus interface in terms of its deformation parameter.

Zoom link: https://pitp.zoom.us/j/98684574364?pwd=WGdrQXhRcHRJZUZMYmNObUVZT1ZCZz09


"ENERGY TRANSPORT FOR THICK HOLOGRAPHIC BRANES" [2212.14058]
1) MOTIVATIONS
2) 2D ICFT
3) THIN BRANE MODEL
4) THICK BRANE MODEL
5) CONCLUSIONS
1)
· EXTENDED PROBES IN QFT
· CONDENSED MATTER PHYSICS
· DYNAMICAL BRANES IN AdS
· QUANTUM INFORMATION
2)
CFT_L
(T_L, T̄_L)
CFT_R
(T_R, T̄_R)
T_tot = T_L + T_R
T_refl = c_R T_L - c_L T_R
<T_L(z) T_L(w)> = (c_L/2) / (z-w)^4
<T_L(z) T_R(w)> = (c_LR/2) / (z-w)^4
CFT_L ⊗ CFT_R



[2212.14058]
CFT_L (T_L, T̄_L)
CFT_R (T_R, T̄_R)
CFT_L ⊗ CFT_R
R_L = 1 - T_L
T_L = C_LR / C_L
UNIVERSALITY
[Quella et al. 07]
[Meineri et al. '19]
3)
CFT_L
CFT_R
σ
ISRAEL MATCHING CONDITIONS
[K_ij] = K^L_ij - K^R_ij


$g^{(2)} = 4\ell G_N \langle T_{\alpha\beta} \rangle$
$g^{(4)} = g^{(2)} (g^{(0)})^{-1} g^{(2)}$
θ
$AdS_2(z,t)$
$dW^\alpha dW^\beta \langle T^L_{\alpha\beta} \rangle = \varepsilon [e^{i\omega(t_L - \mu_L)} d(t_L - \mu_L)^2 + R_L e^{i\omega(t_L+\mu_L)} d(t_L+\mu_L)^2]$
$\langle T^R_{\alpha\beta} \rangle dW^\alpha dW^\beta = \varepsilon T_L e^{i\omega(t_R - \mu_R)} d(t_R - \mu_R)^2]$
PERTURBATION
FG COORDINATES
$ds^2 = \frac{\ell^2}{\xi^2} (d\xi^2 + (g^{(0)}_{\alpha\beta} + \frac{\xi^2}{\ell^2} g^{(2)}_{\alpha\beta} + \frac{\xi^4}{4\ell^2} g^{(4)}_{\alpha\beta}) dW^\alpha dW^\beta)$
$W^\pm = \mu \pm t$

- IMPOSE ISRAEL MATCHING
- IMPOSE NO-OUTGOING WAVE CONDITIONS (IN THE IR)

$$\hat{K}_{ij} = K_{ij} - K\gamma_{ij}$$

$$T_L = \frac{2}{\ell_L}\left(\frac{1}{\ell_L} + \frac{1}{\ell_R} + 8\pi G_N \sigma\right)^{-1}$$

$$\left|\frac{1}{\ell_L} - \frac{1}{\ell_R}\right| \leq 8\pi G_N \sigma \leq \frac{1}{\ell_L} + \frac{1}{\ell_R}$$

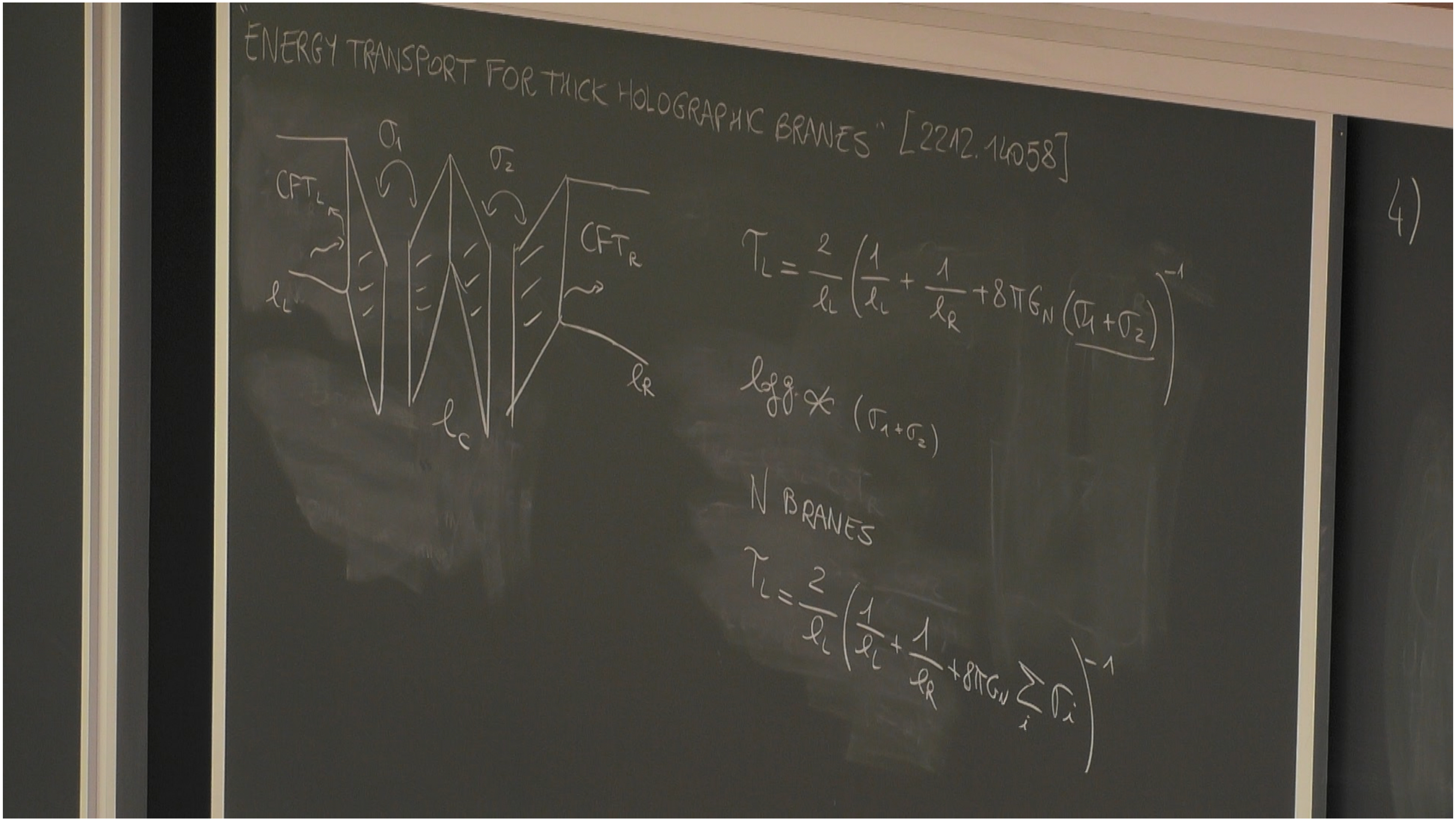
$$\log g \sim \sigma$$

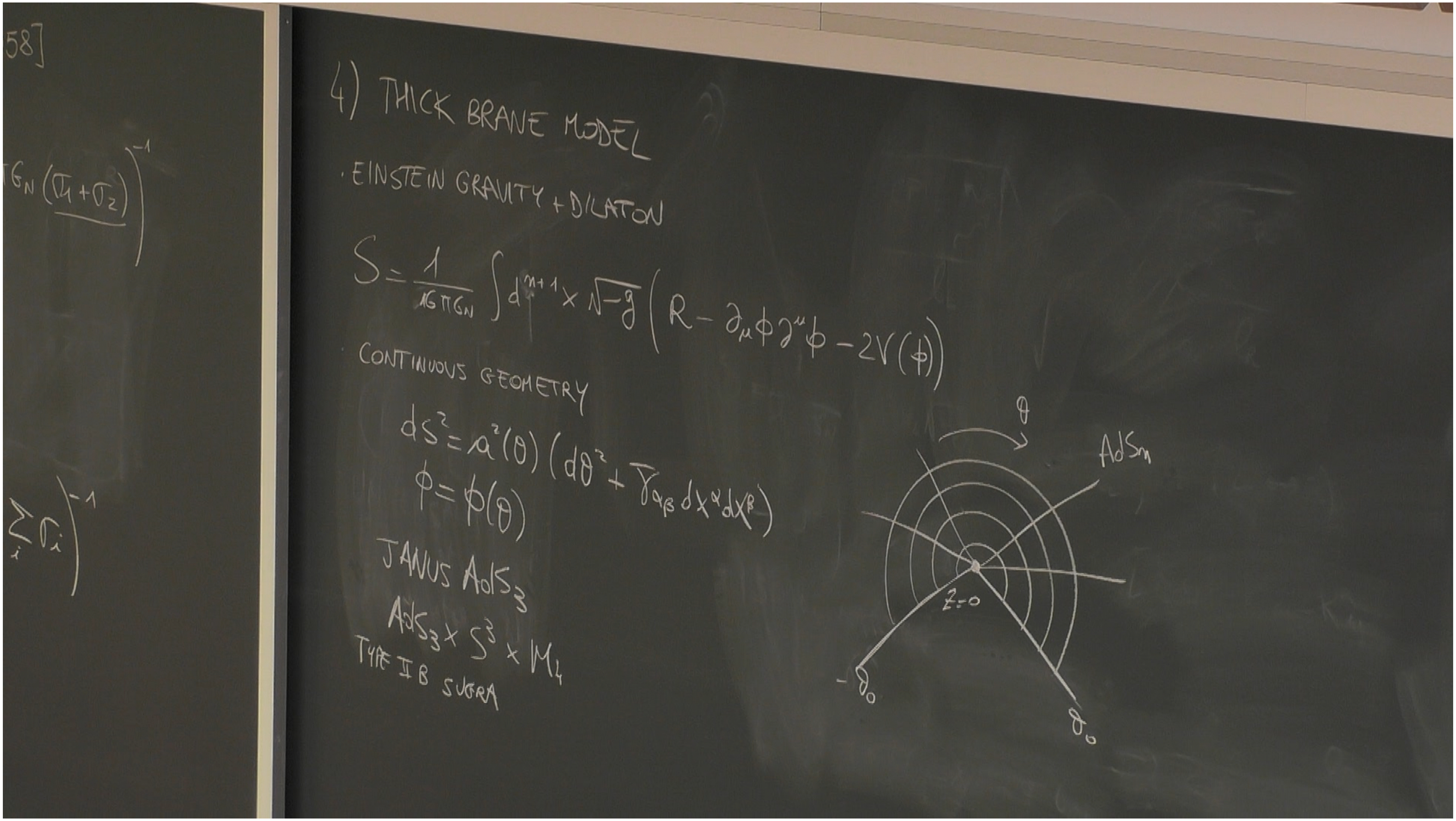
EMPTY AdS: $\sigma = 0$, $\ell_L = \ell_R \Rightarrow T_L = 1$

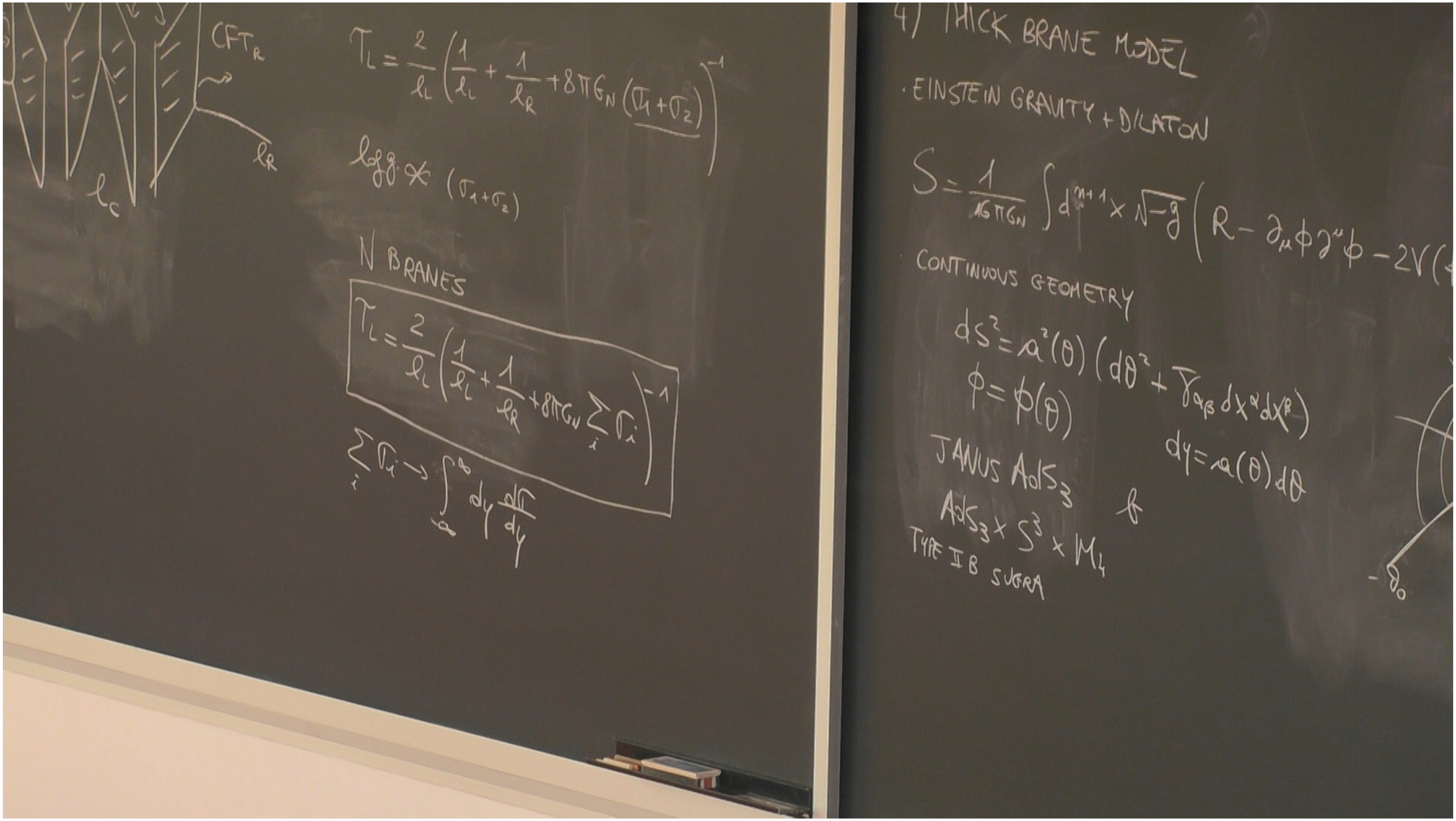
$$\Rightarrow \frac{C_R}{C_L + C_R} \leq T_L \leq \min\left(1, \frac{C_R}{C_L}\right)$$

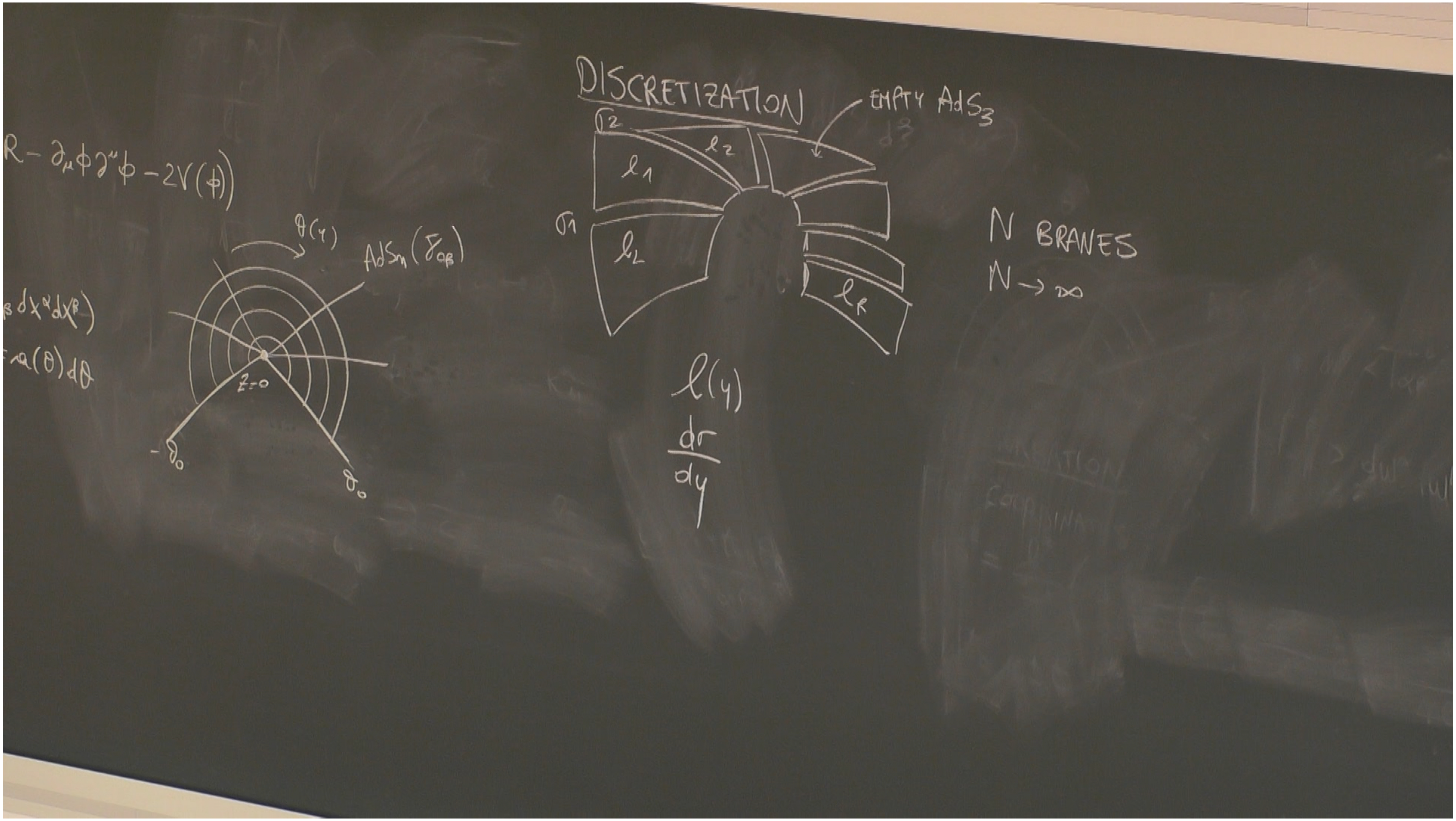
ANEC: $0 \leq T_L \leq \min\left(1, \frac{C_R}{C_L}\right)$

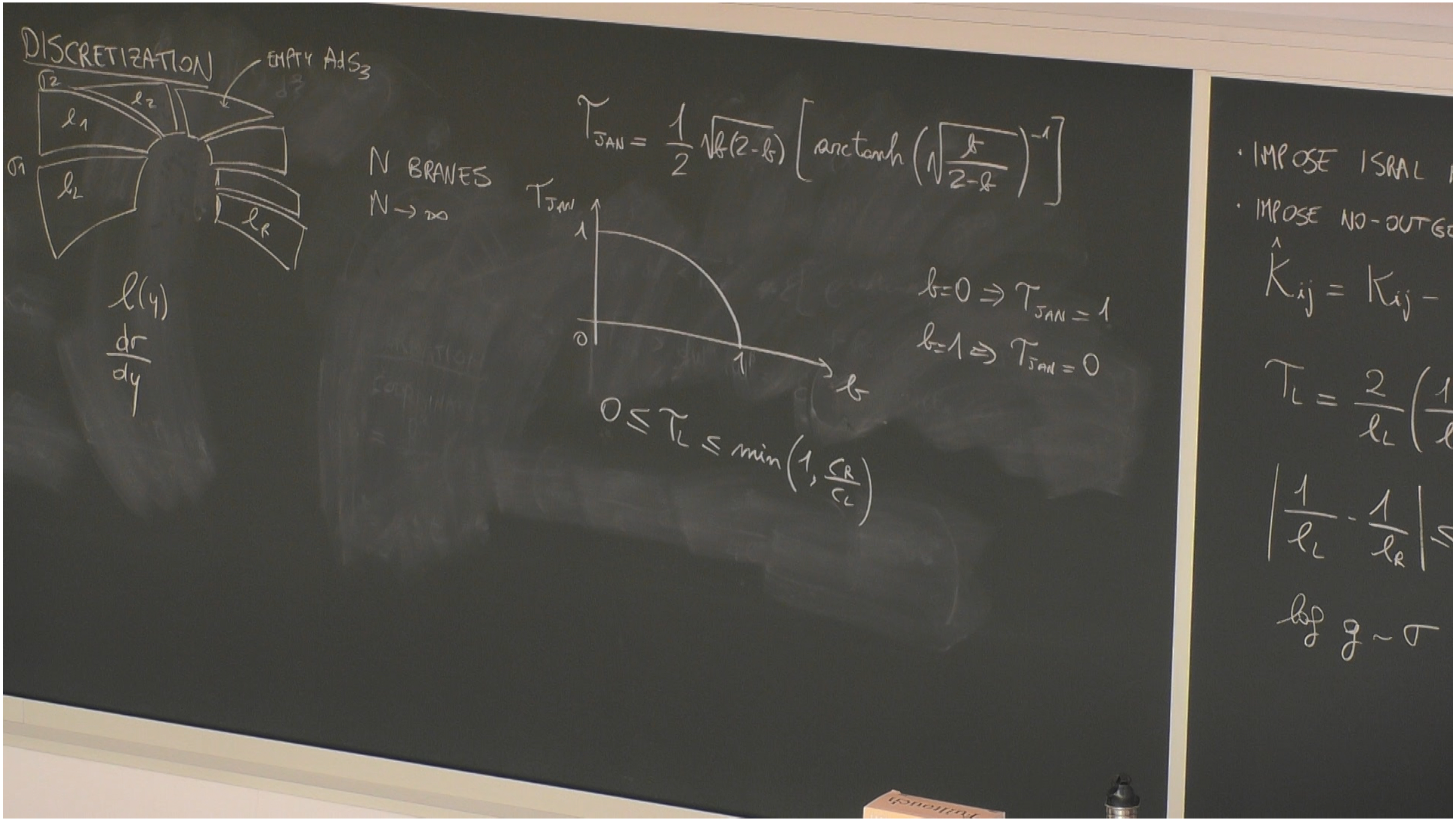
$$\frac{C_R}{C_L} \to 0$$

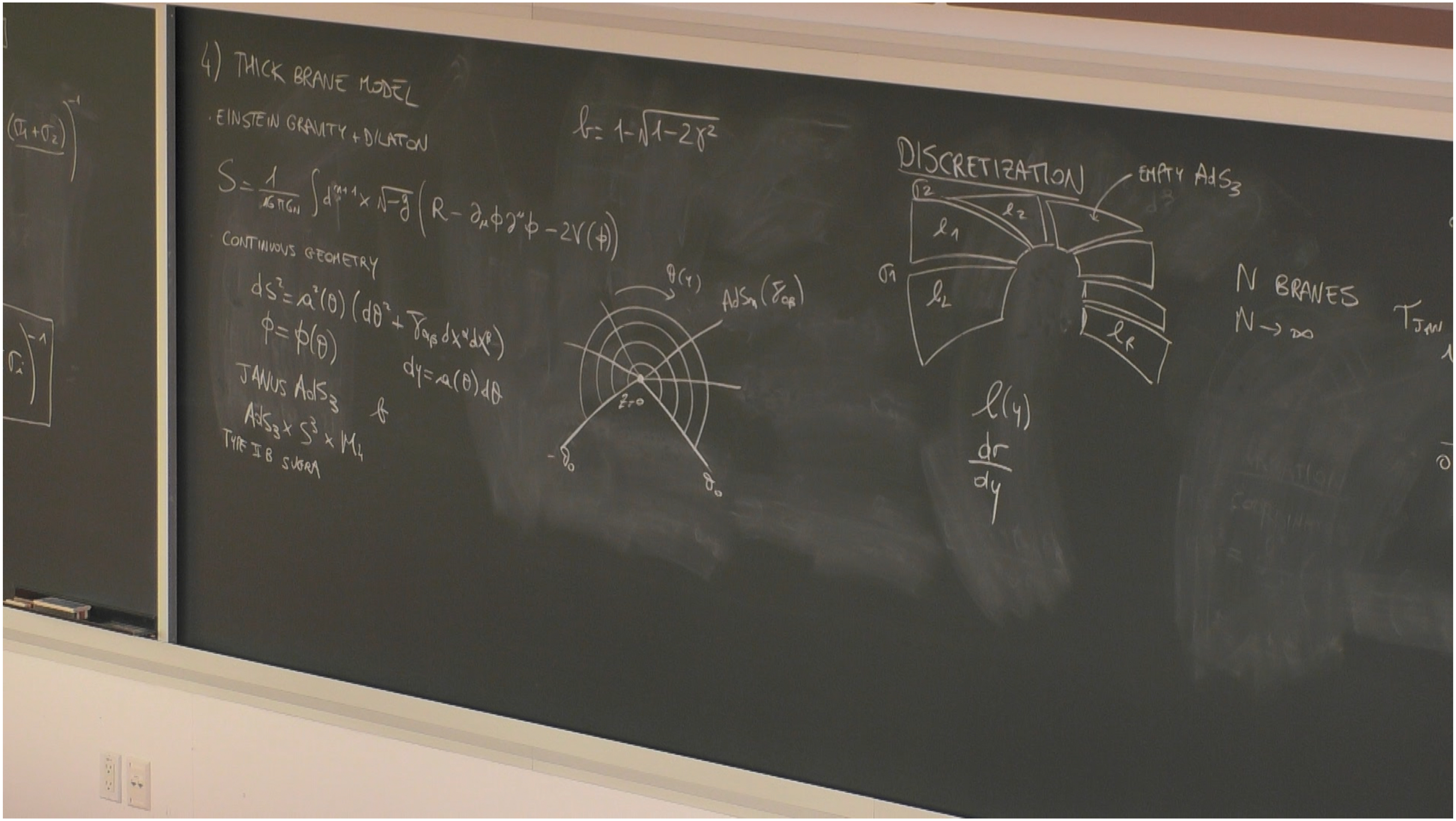

"ENERGY TRANSPORT FOR THICK HOLOGRAPHIC BRANES" [2212.14058]
σ_1
σ_2
CFT_L
CFT_R
ℓ_L
ℓ_C
ℓ_R
$\mathcal{T}_L = \frac{2}{\ell_L}\left(\frac{1}{\ell_L} + \frac{1}{\ell_R} + 8\pi G_N (\sigma_1 + \sigma_2)\right)^{-1}$
$\ell_{eff} \propto (\sigma_1 + \sigma_2)$
N BRANES
$\mathcal{T}_L = \frac{2}{\ell_L}\left(\frac{1}{\ell_L} + \frac{1}{\ell_R} + 8\pi G_N \sum_i \sigma_i\right)^{-1}$
4)


58]
4) THICK BRANE MODEL
· EINSTEIN GRAVITY + DILATON
S = 1/(16πG_N) ∫ d^{n+1}x √-g (R - ∂_μφ ∂^μφ - 2V(φ))
· CONTINUOUS GEOMETRY
ds² = a²(θ) (dθ² + γ_{αβ} dx^α dx^β)
φ = φ(θ)
JANUS AdS_3
AdS_3 × S^3 × M_4
TYPE IIB SUGRA
θ
AdS_n
z=0
-θ_0
θ_0


CFT_R
ℓ_C
ℓ_R
$T_L = \frac{2}{\ell_L}\left(\frac{1}{\ell_L} + \frac{1}{\ell_R} + 8\pi G_N(\sigma_1+\sigma_2)\right)^{-1}$
$\log g \propto (\sigma_1+\sigma_2)$
N BRANES
$T_L = \frac{2}{\ell_L}\left(\frac{1}{\ell_L} + \frac{1}{\ell_R} + 8\pi G_N \sum_i \sigma_i\right)^{-1}$
$\sum_i \sigma_i \to \int_{-\infty}^{\infty} dy \frac{d\sigma}{dy}$
4) THICK BRANE MODEL
· EINSTEIN GRAVITY + DILATON
$S = \frac{1}{16\pi G_N}\int d^{n+1}x\sqrt{-g}\left(R - \partial_\mu\phi\partial^\mu\phi - 2V(\phi)\right.$
CONTINUOUS GEOMETRY
$ds^2 = a^2(\theta)\left(d\theta^2 + \gamma_{\alpha\beta}dx^\alpha dx^\beta\right)$
$\phi = \phi(\theta)$
$dy = a(\theta)d\theta$
JANUS AdS_3
$AdS_3 \times S^3 \times M_4$
TYPE IIB SUGRA
$-\theta_0$


DISCRETIZATION
EMPTY AdS3
N BRANES
N → ∞
AdS4 (γαβ)
θ(y)
z=0
-θ0
θ0
ℓ1
ℓ2
ℓL
ℓR
σ1
σ2
ℓ(y)
dσ/dy
R − ∂μφ∂μφ − 2V(φ))


DISCRETIZATION
EMPTY AdS3
N BRANES
N → ∞
l(y)
dσ/dy
T_JAN = 1/2 √(b(2-b)) [arctanh(√(b/(2-b)))]^-1
b=0 ⇒ T_JAN = 1
b=1 ⇒ T_JAN = 0
0 ≤ T_L ≤ min(1, c_R/c_L)
· IMPOSE ISRAL
· IMPOSE NO-OUTG
log g ~ σ


4) THICK BRANE MODEL
· EINSTEIN GRAVITY + DILATON
CONTINUOUS GEOMETRY
JANUS AdS3
TYPE II B SUGRA
DISCRETIZATION
EMPTY AdS3
N BRANES
N → ∞