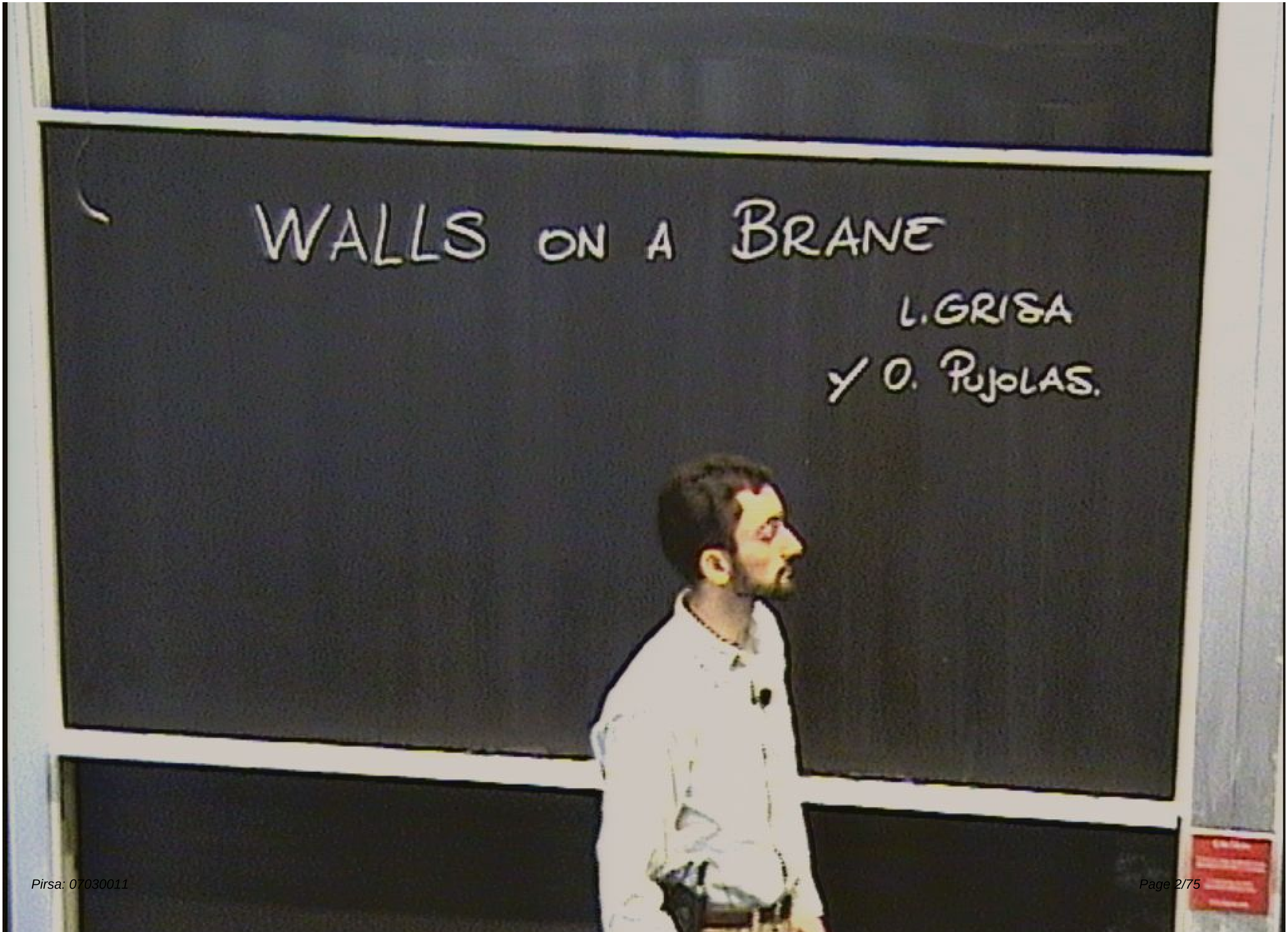
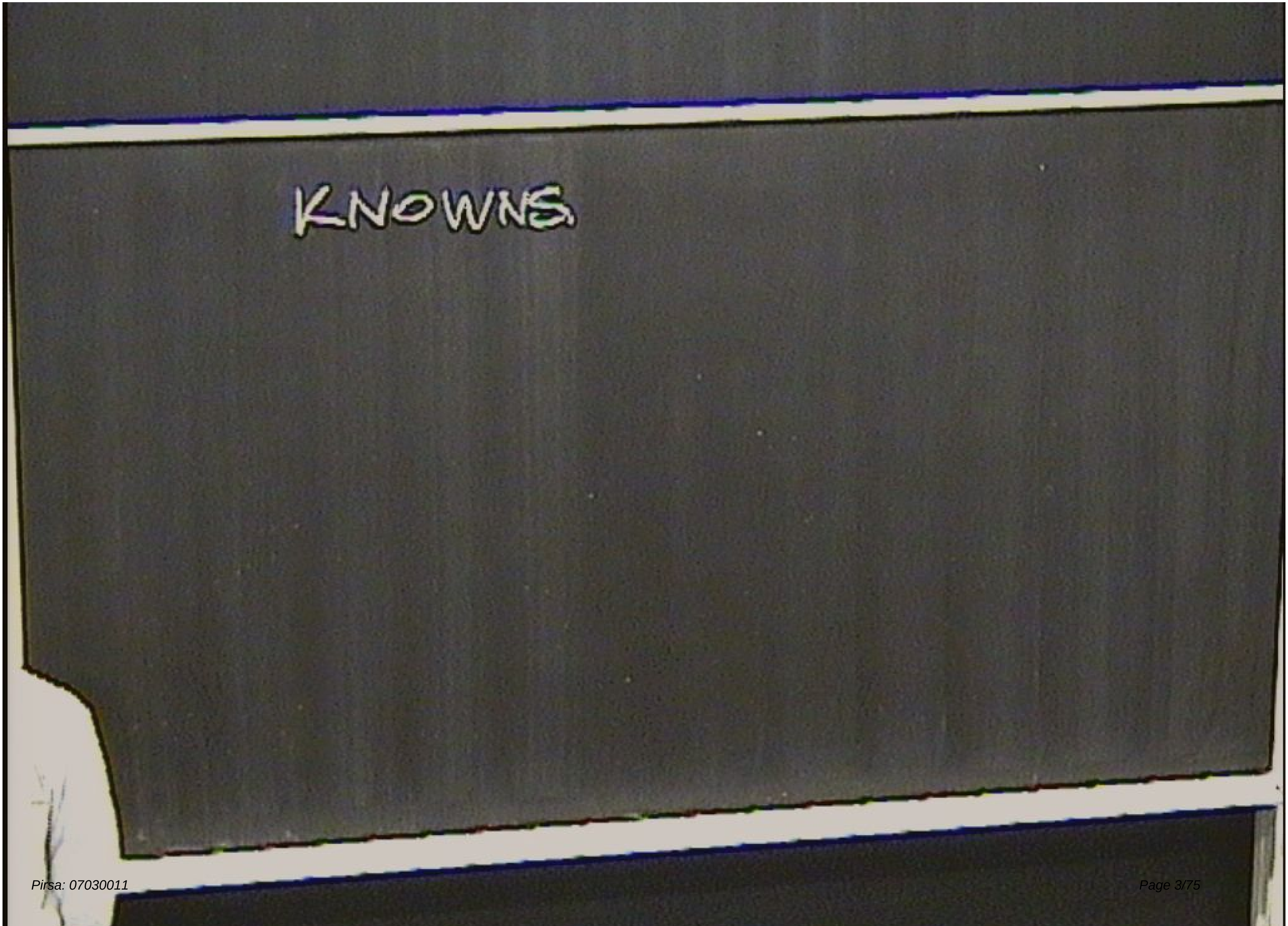
Title: Walls on a brane

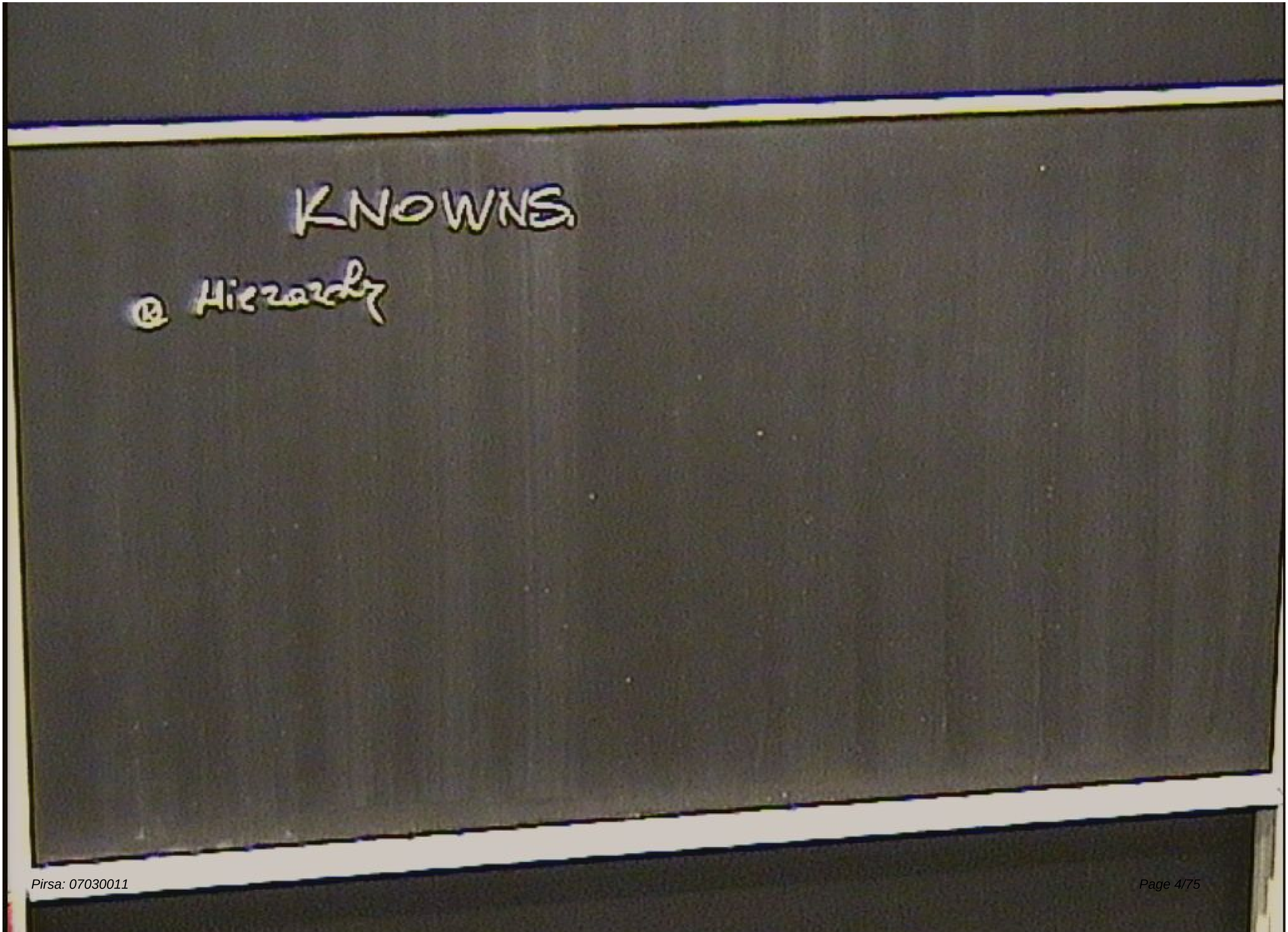
Date: Mar 13, 2007 11:00 AM

URL: http://pirsa.org/07030011

Abstract: TBA


WALLS ON A BRANE
L. GRISA
y O. PUJOLAS.


KNOWNS.


KNOWNS
① Hierarchy

KNOWNS

① Hierarchy

$$\left(\frac{T}{G M^3}\right)^2 = \frac{1}{\epsilon^2}$$

KNOWNS

(a) Hierarchy

$$\left(\frac{T}{6M'}\right)^2 = \frac{1}{e^2} \Rightarrow \text{flat 4D}$$

KNOWNS

⊗ Hierarchy

$$\left(\frac{T}{6M^3}\right)^2 = \frac{1}{\ell^2} \Rightarrow \text{flat 4D}$$

⊗ detuned RS.

KR → mass gap

KNOWNS.

- Hierarchy

$$\left(\frac{T}{6M^3}\right)^2 = \frac{1}{\ell^2} \Rightarrow \text{flat 4D}$$

- detuned RS.

KR → mass gap

hep-th/0601213

KNOWNS.

⊗ Hierarchy

$$\left(\frac{T}{6M^3}\right)^2 = \frac{1}{\ell^2} \Rightarrow \text{flat 4D}$$

⊗ detuned RS.

KR → mass gap

hep-th/0601213

⊗ CFT dual.

KNOWNS.

- ⊗ Hierarchy

$$\left(\frac{T}{6M^3}\right)^2 = \frac{1}{\ell^2} \Rightarrow \text{flat 4D}$$

- ⊗ detuned RS.

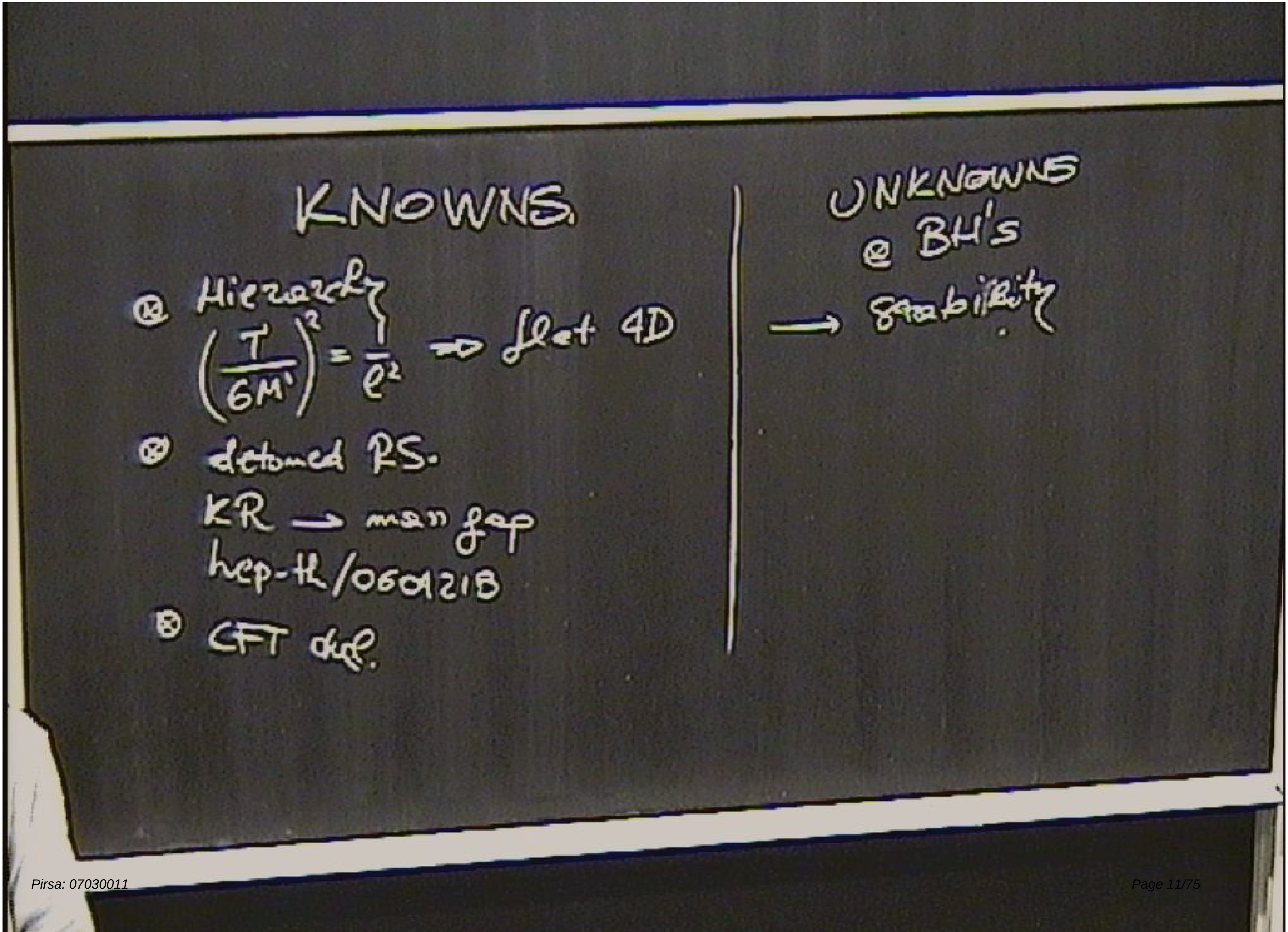
KR → mass gap

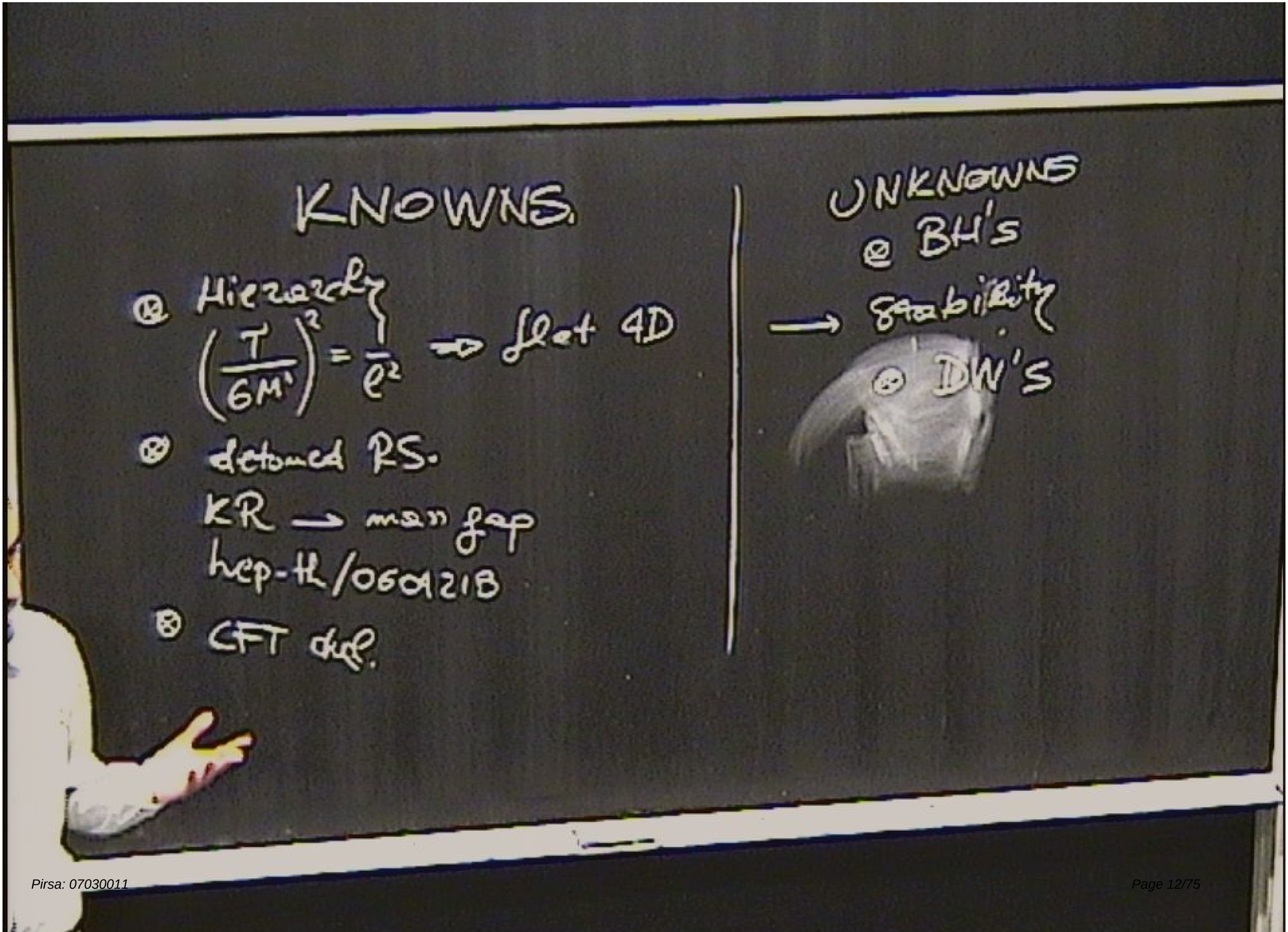
hep-th/0601213

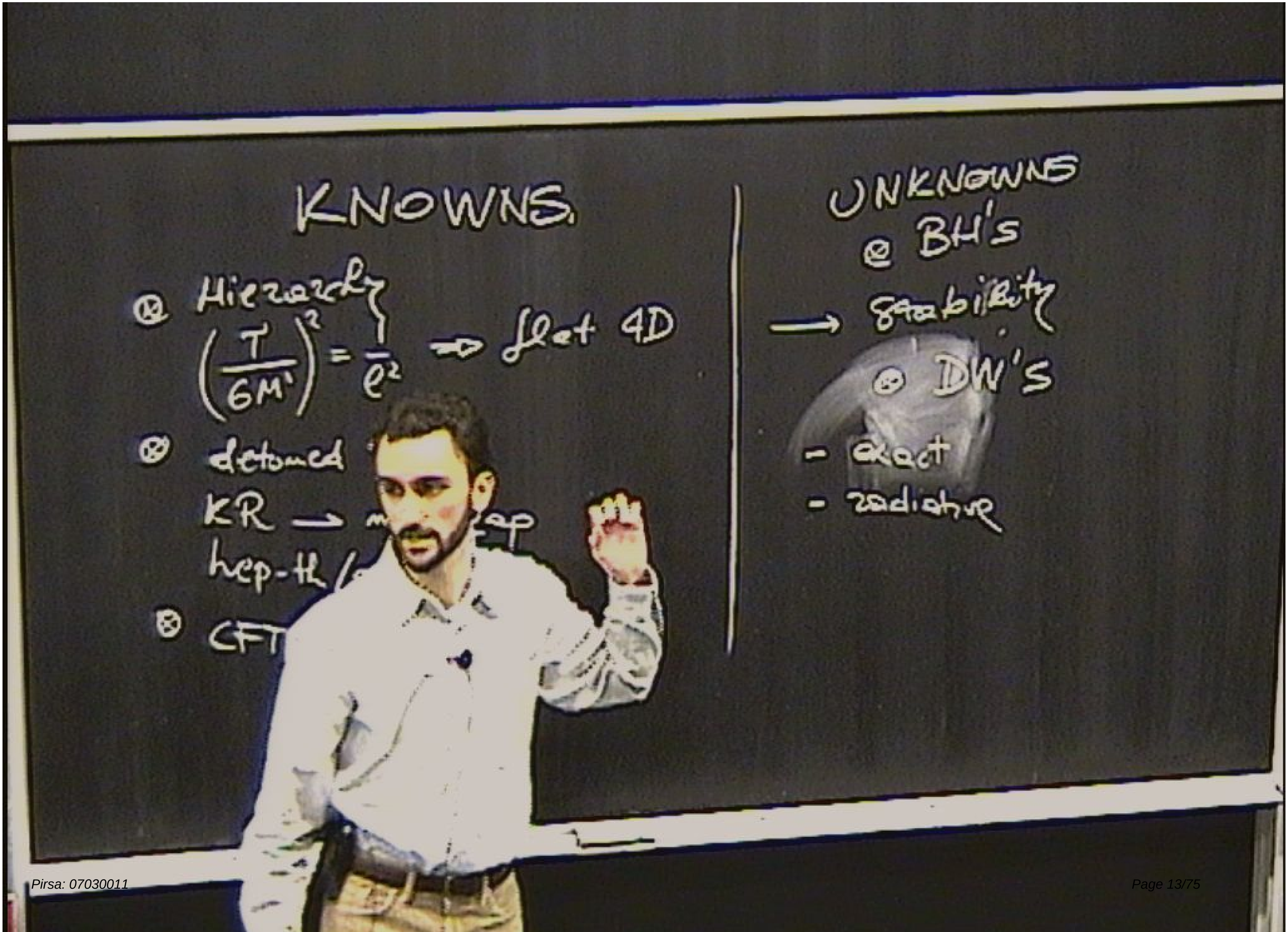
- ⊗ CFT dual.

UNKNOWNS

- ⊗ BH's


KNOWNS.
⊗ Hierarchy
(T / 6M³)² = 1 / ℓ² ⇒ flat 4D
⊗ detuned RS.
KR → mass gap
hep-th/0601213
⊗ CFT dual.
UNKNOWNS
@ BH's
→ stability

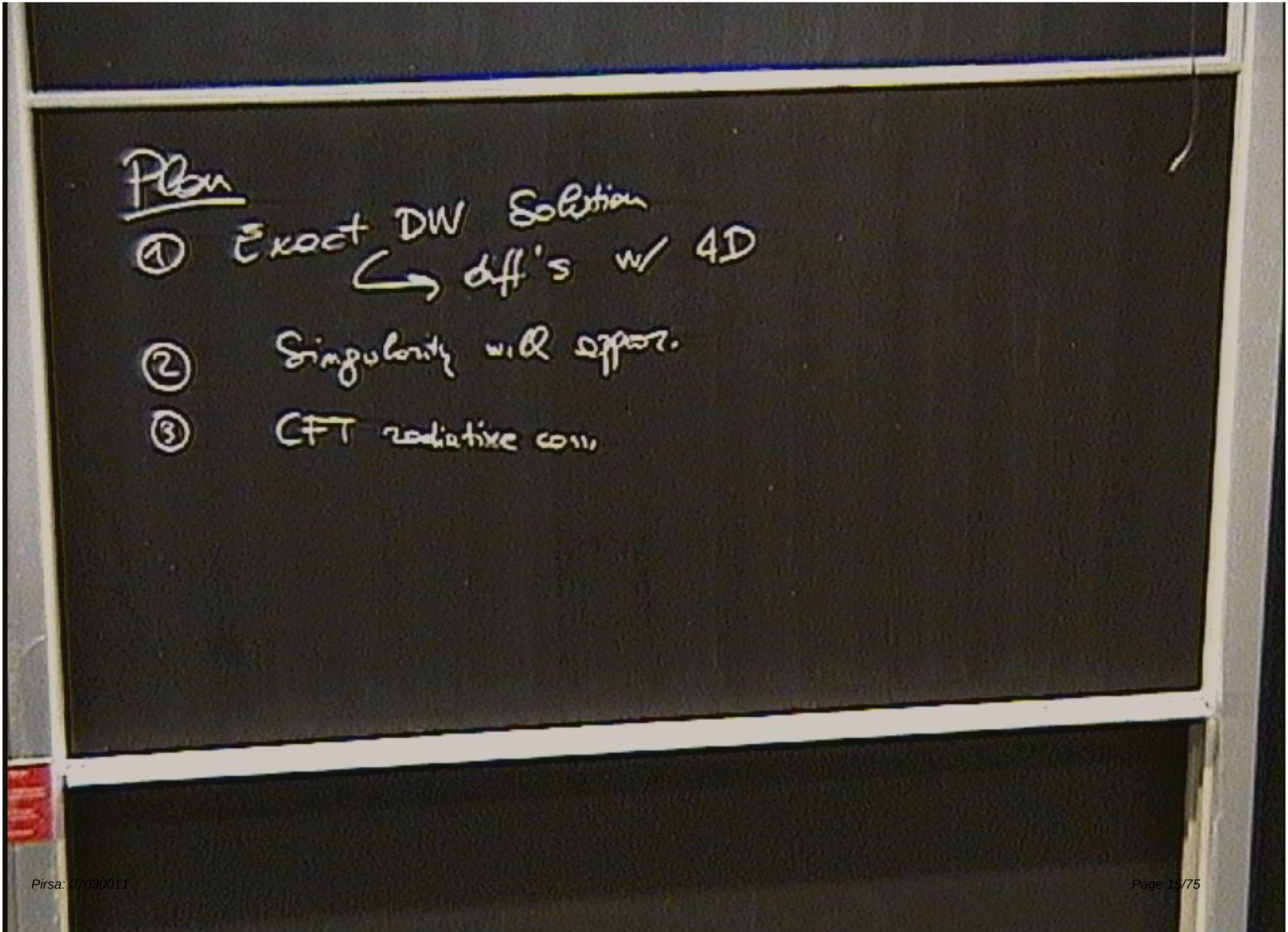

KNOWNS.
⊗ Hierarchy
$\left(\frac{T}{6M^3}\right)^2 = \frac{1}{\ell^2}$ ⇒ flat 4D
⊗ detuned RS.
KR → mass gap
hep-th/0609218
⊗ CFT dual.
UNKNOWNS
⊗ BH's
→ stability
⊗ DW's

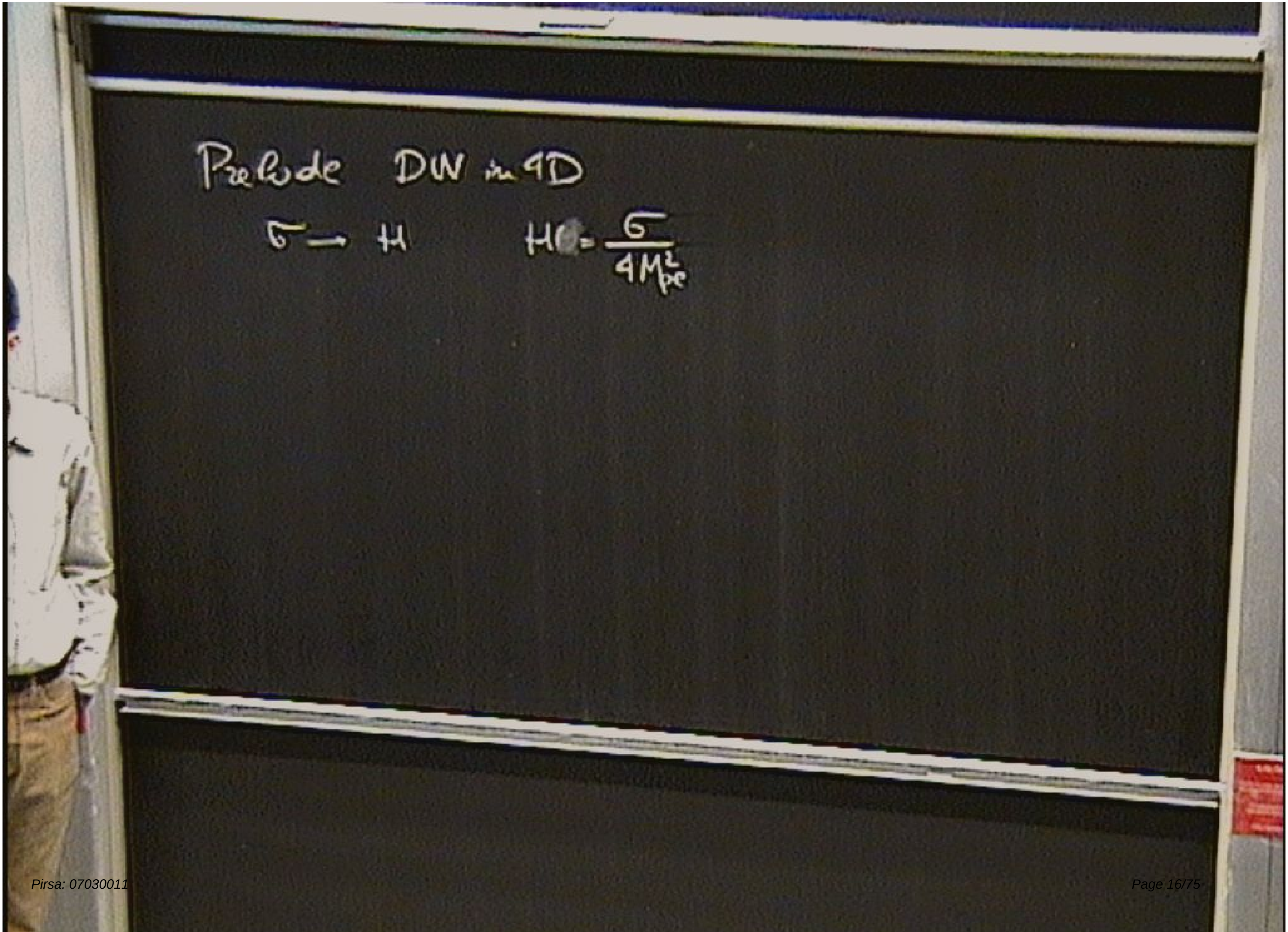

KNOWNS.
Hierarchy
flat 4D
detuned
KR
hep-th
CFT
UNKNOWNS
@ BH's
stability
DW's
- exact
- radiative

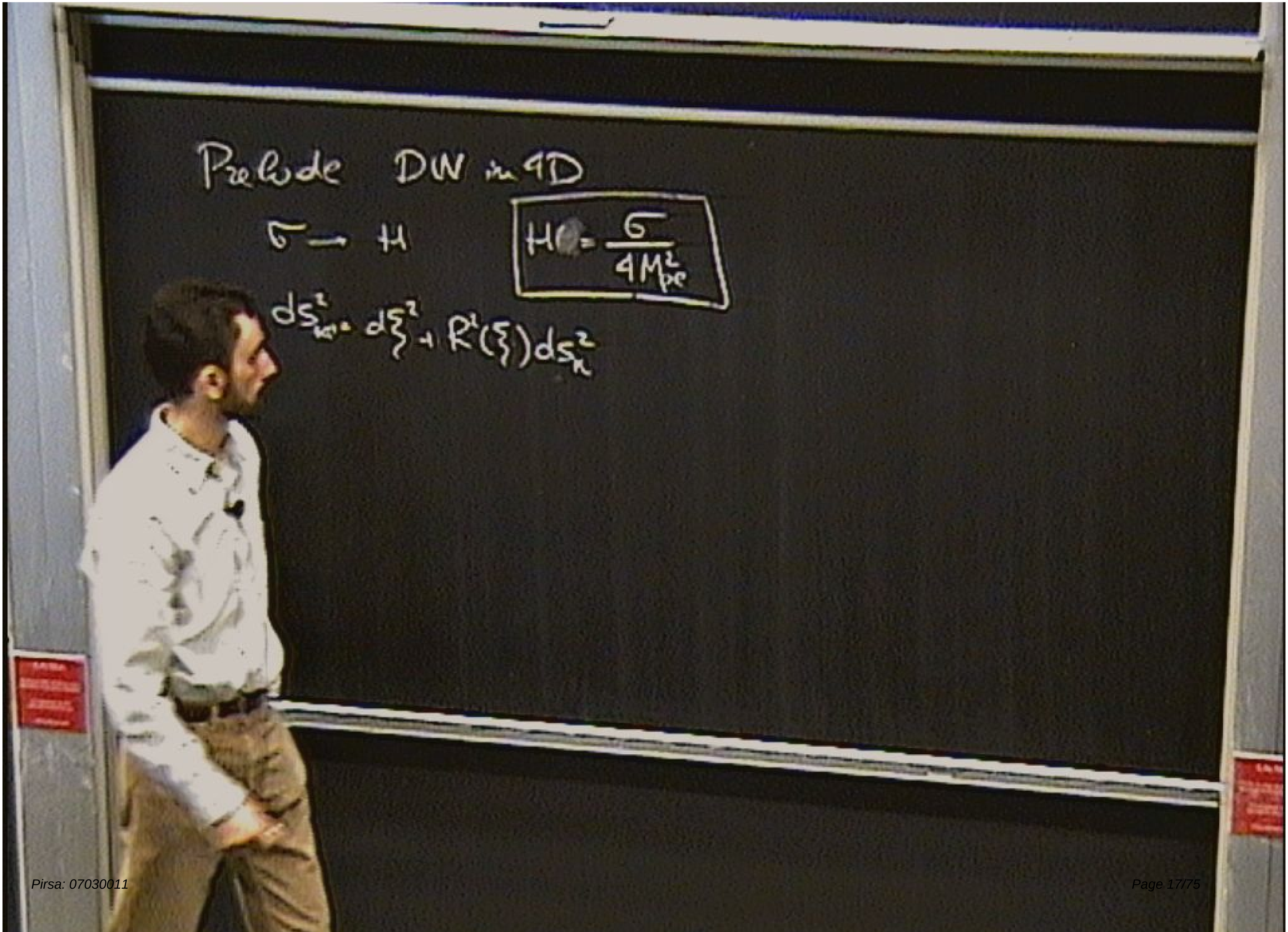
Plan

① Exact DW Solution
↳ diff's w/ 4D

②


Plan
① Exact DW Solution
↳ diff's w/ 4D
② Singularity will appear.
③ CFT radiative corr.


Prelude DW in 4D
σ → H


Prelude DW in 4D
σ → H
H = σ / 4M²
ds² = dξ² + R²(ξ) ds²

Prelude DW in 4D

$\sigma \to H$

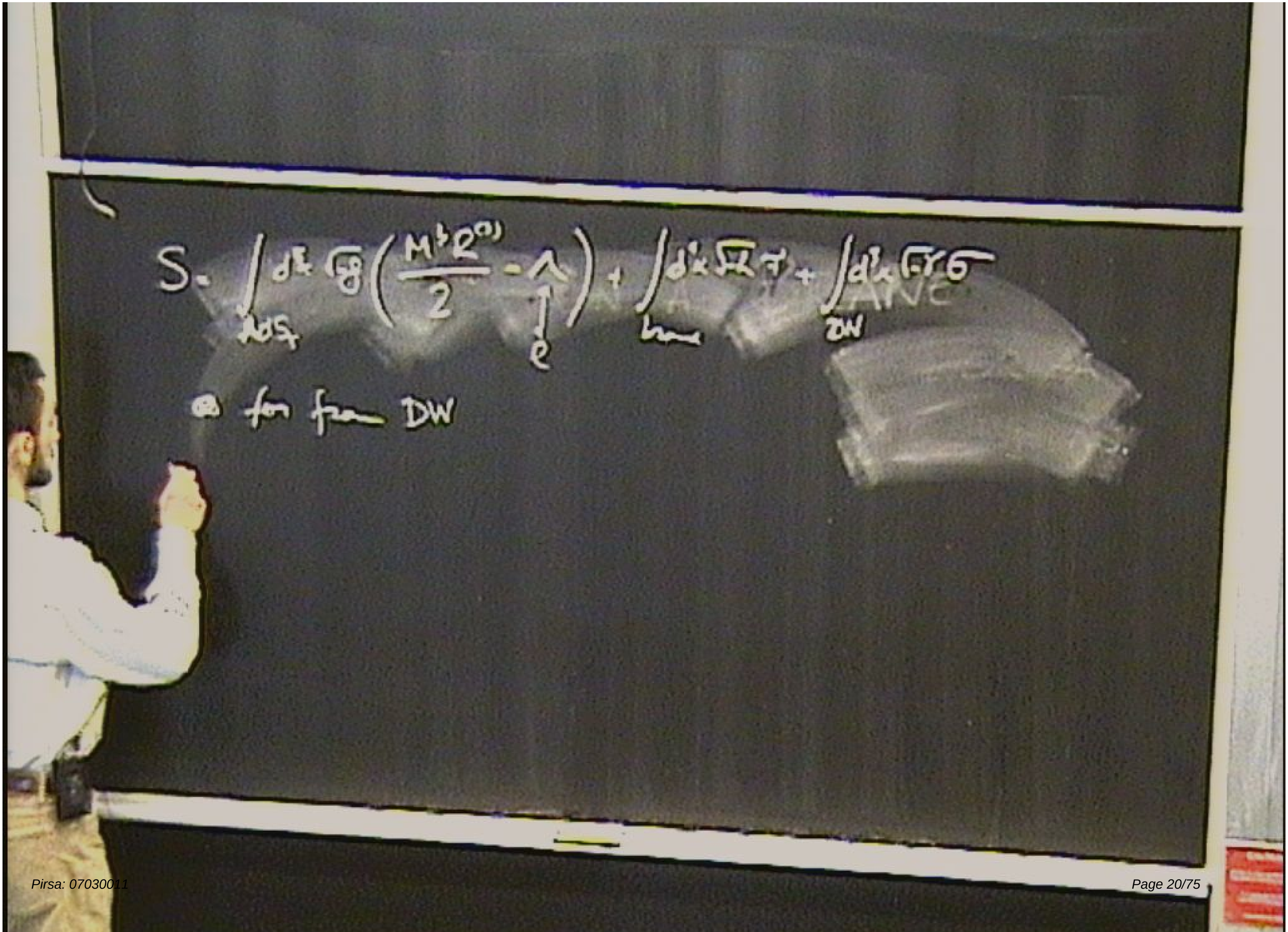
$$H = \frac{\sigma}{4M_{pl}^2}$$

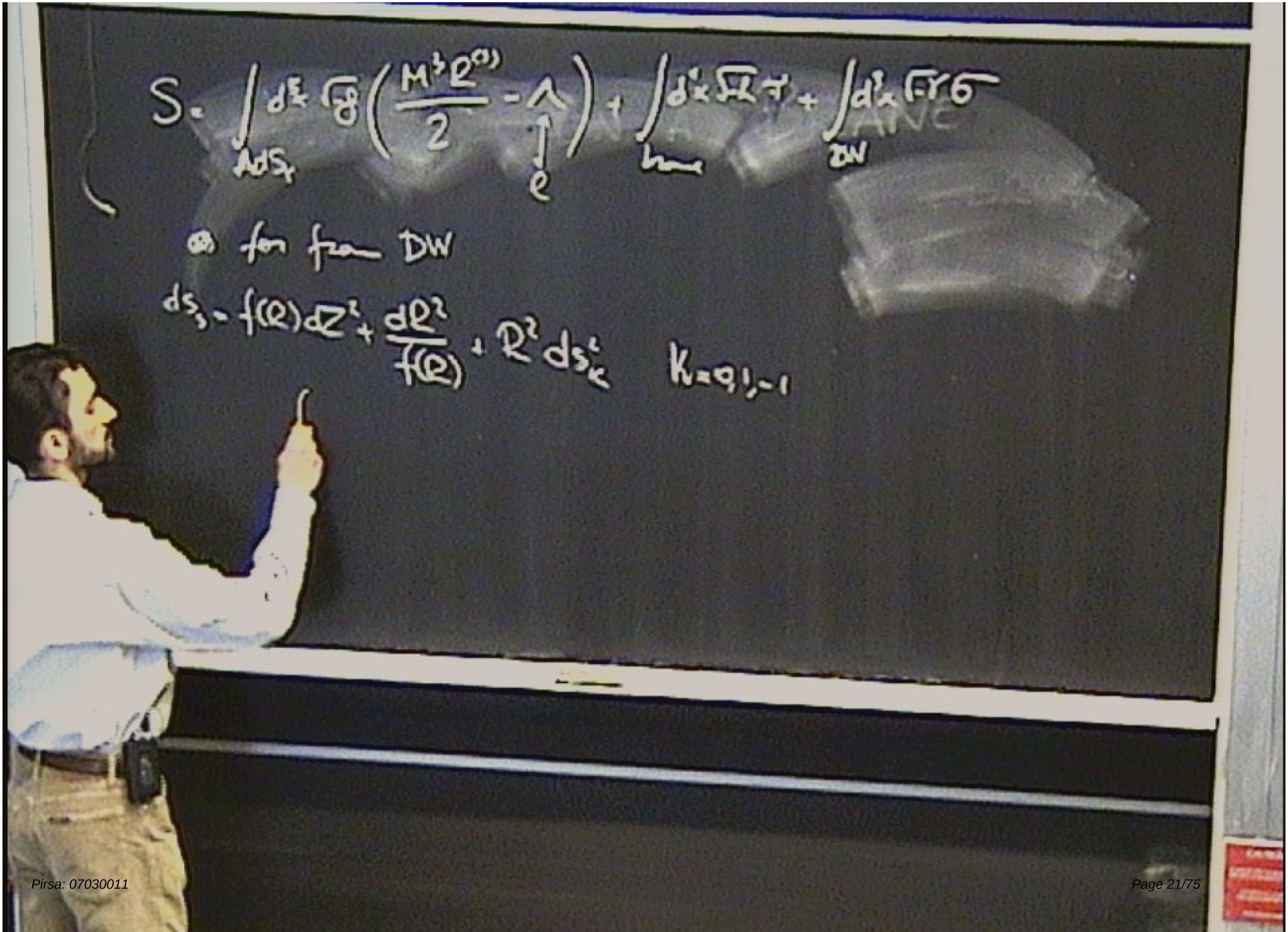
$$ds_{\infty}^2 = d\xi^2 + R^2(\xi)\, ds_n^2$$

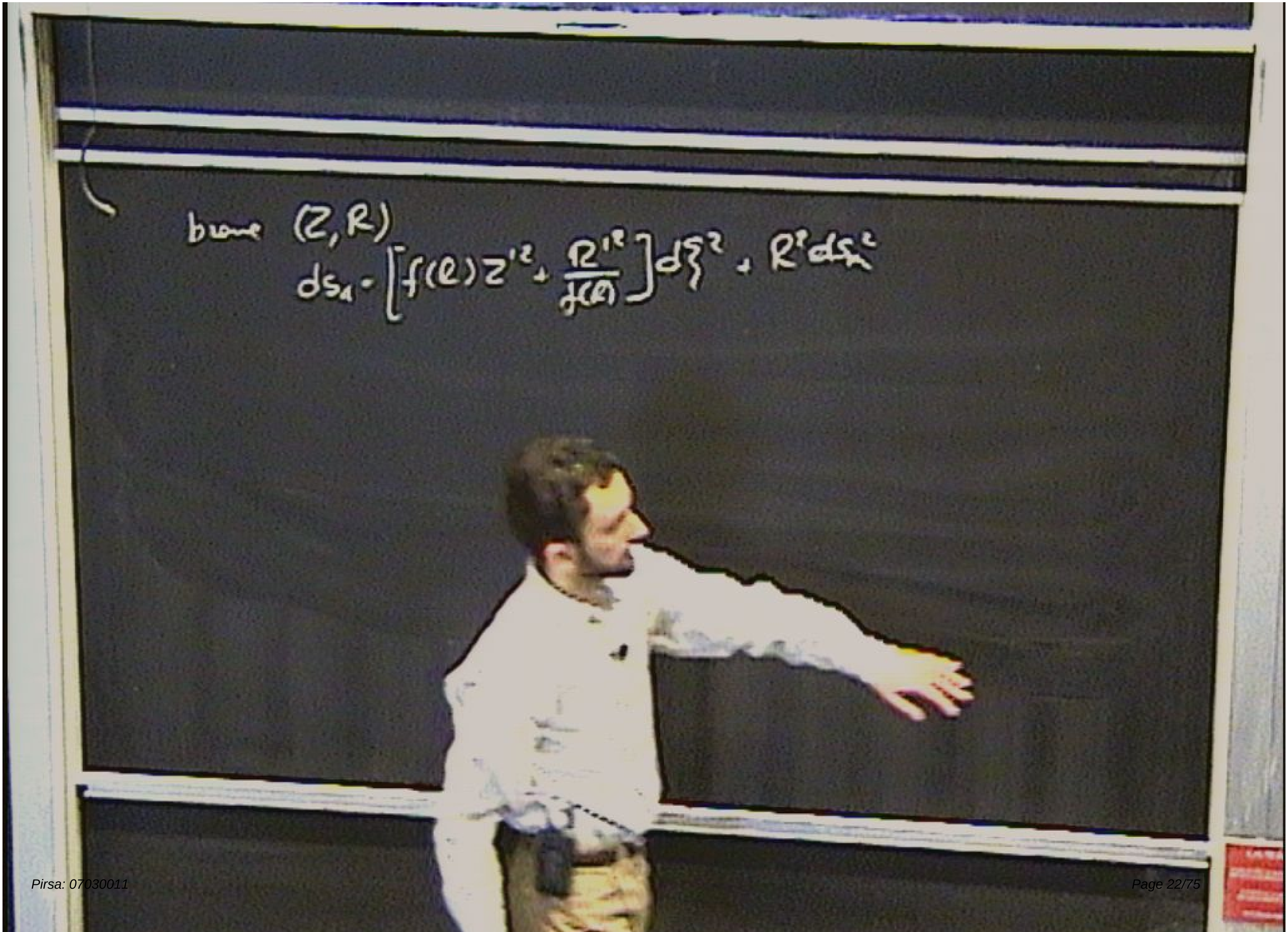
$ds_n^2 \to ds_3$

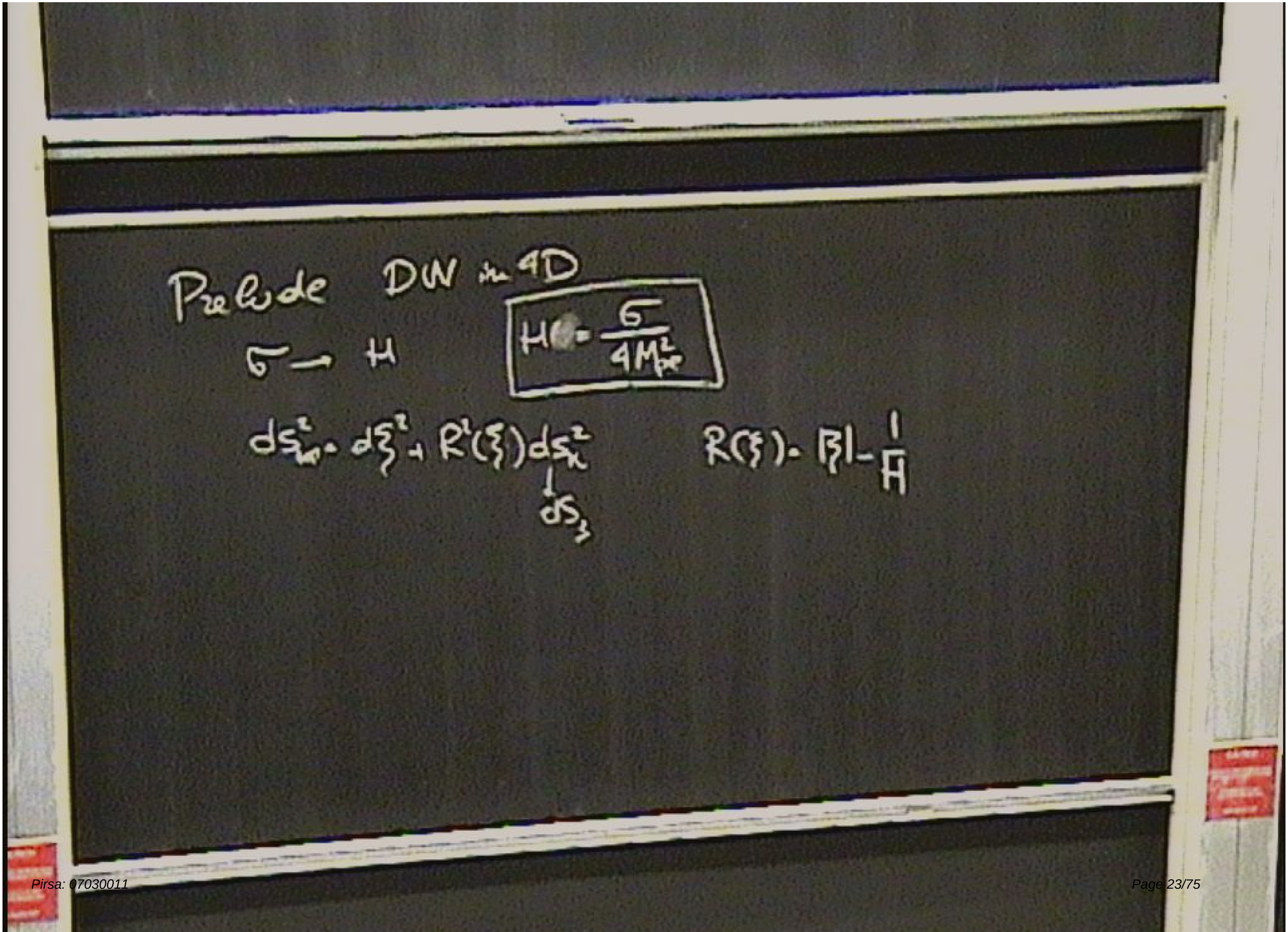
$$R(\xi) = |\xi| - \frac{1}{H}$$

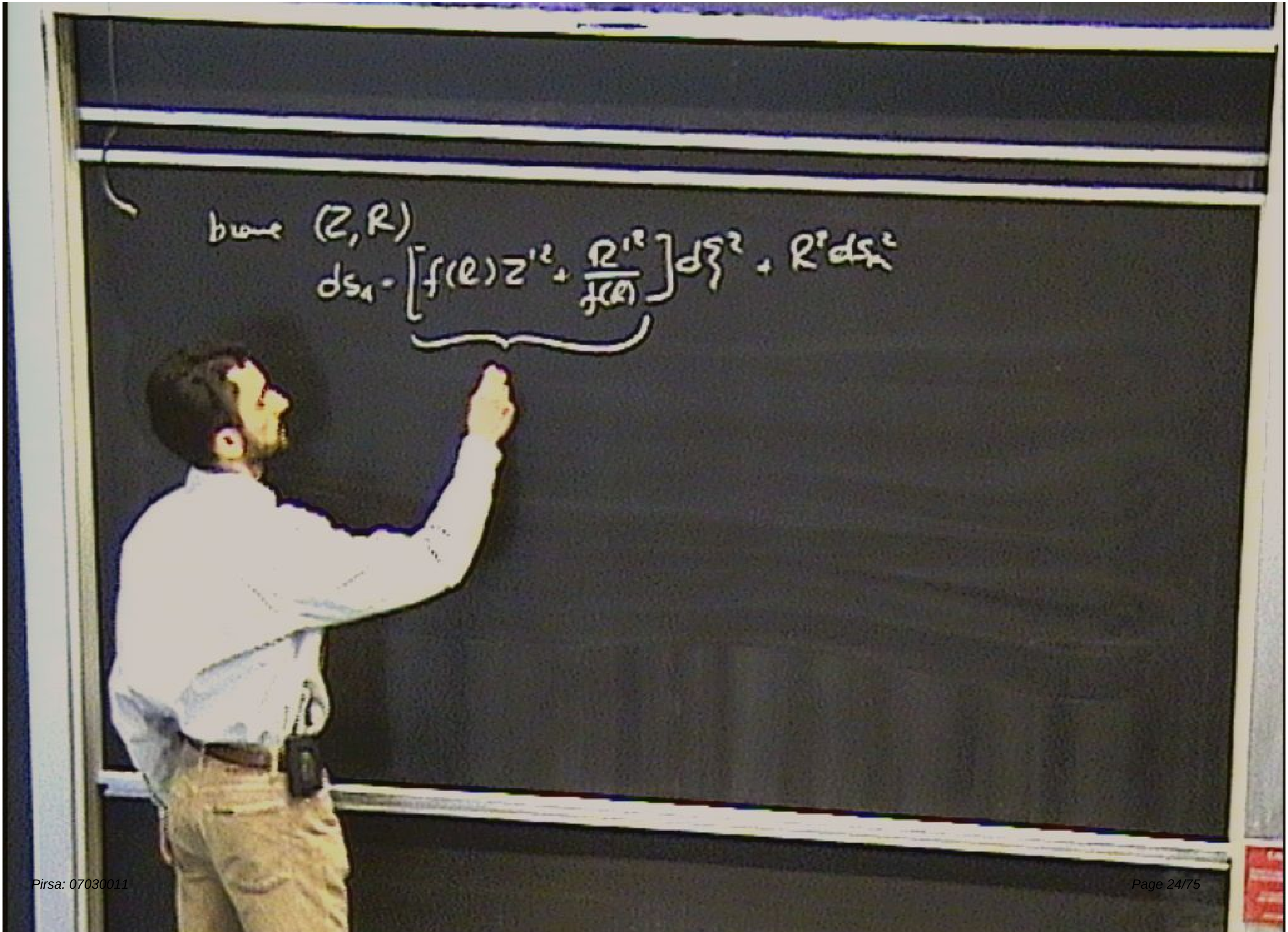
$$S = \int_{AdS_7} d^7x \sqrt{g}\left(\frac{M^5 R^{(7)}}{2} - \Lambda\right) + \int_{brane} d^6x \sqrt{h}\,\tau + \int_{DW} d^5x \sqrt{\gamma}\,\sigma$$

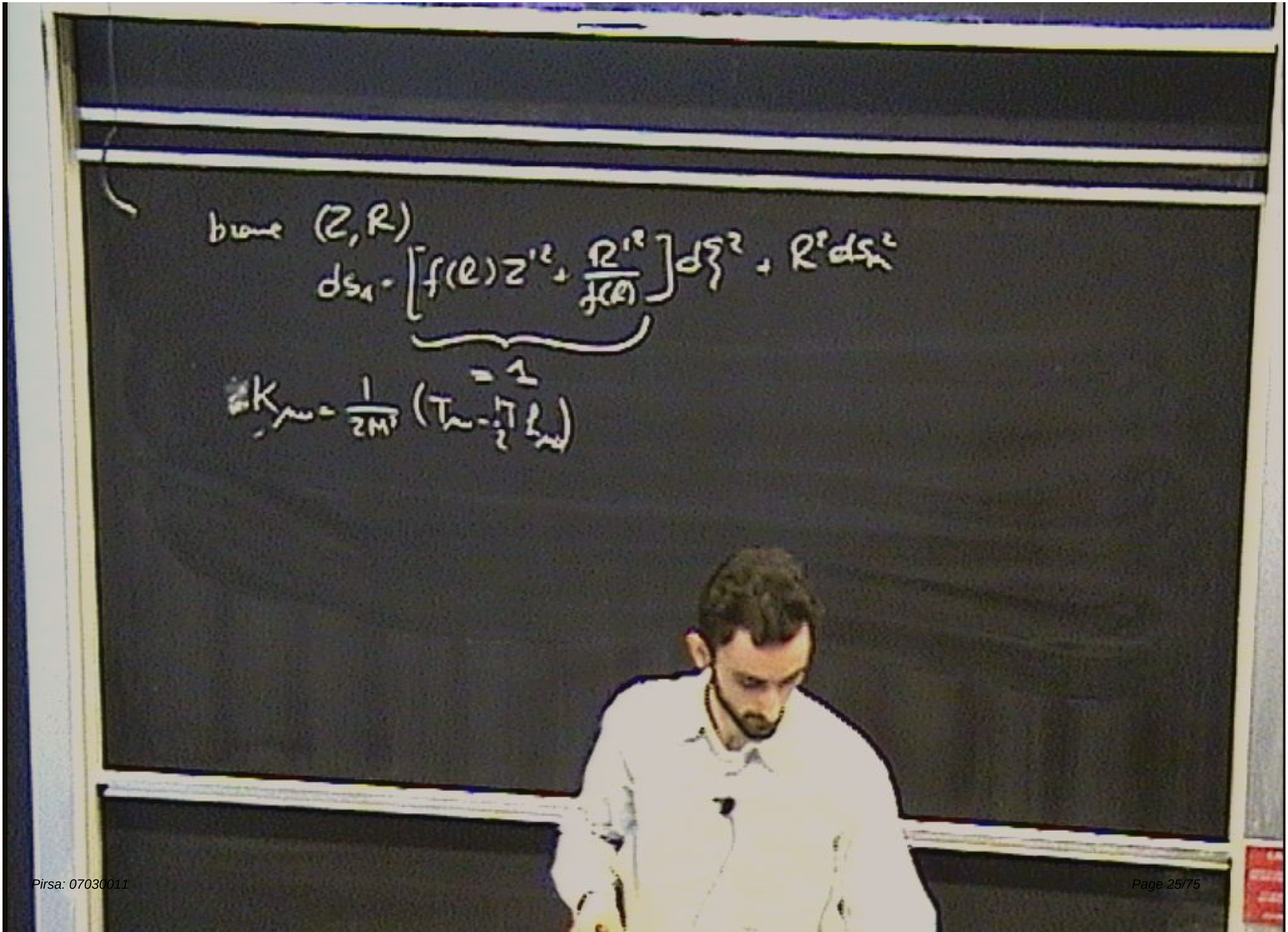

S = ∫ d^5x √g (M^3 R^(5) / 2 − Λ) + ∫ d^4x √h τ + ∫ d^4x √γ σ
AdS5
brane
DW
force from DW

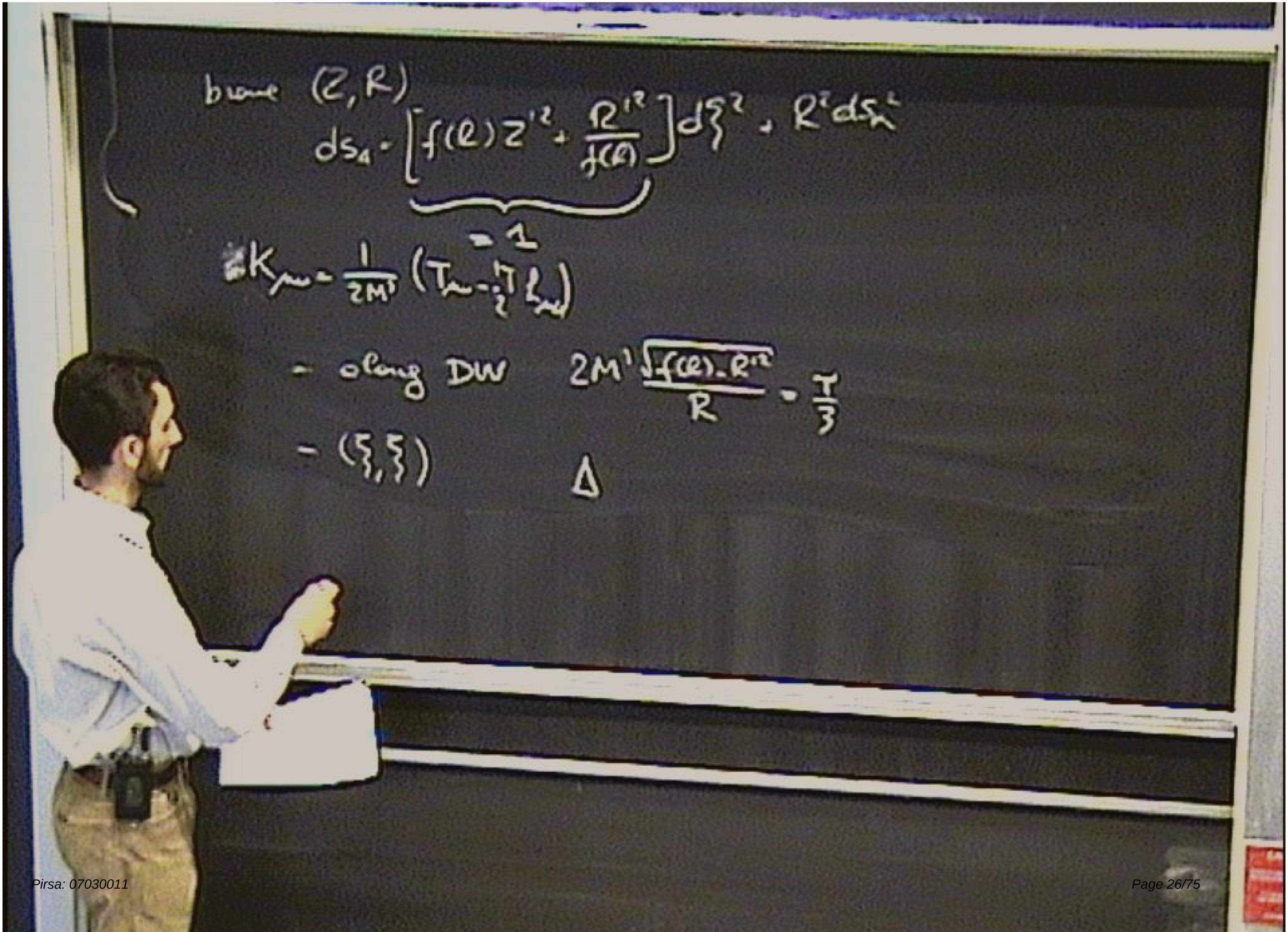

S = ∫ d⁵x √g (M³R⁽⁵⁾/2 − Λ) + ∫ d⁴x √-h σ + ∫ d⁴x √-γ σ
AdS5
brane
DW
for far from DW
ds5 = f(R)dz² + dR²/f(R) + R² ds²k
k = 0, 1, -1

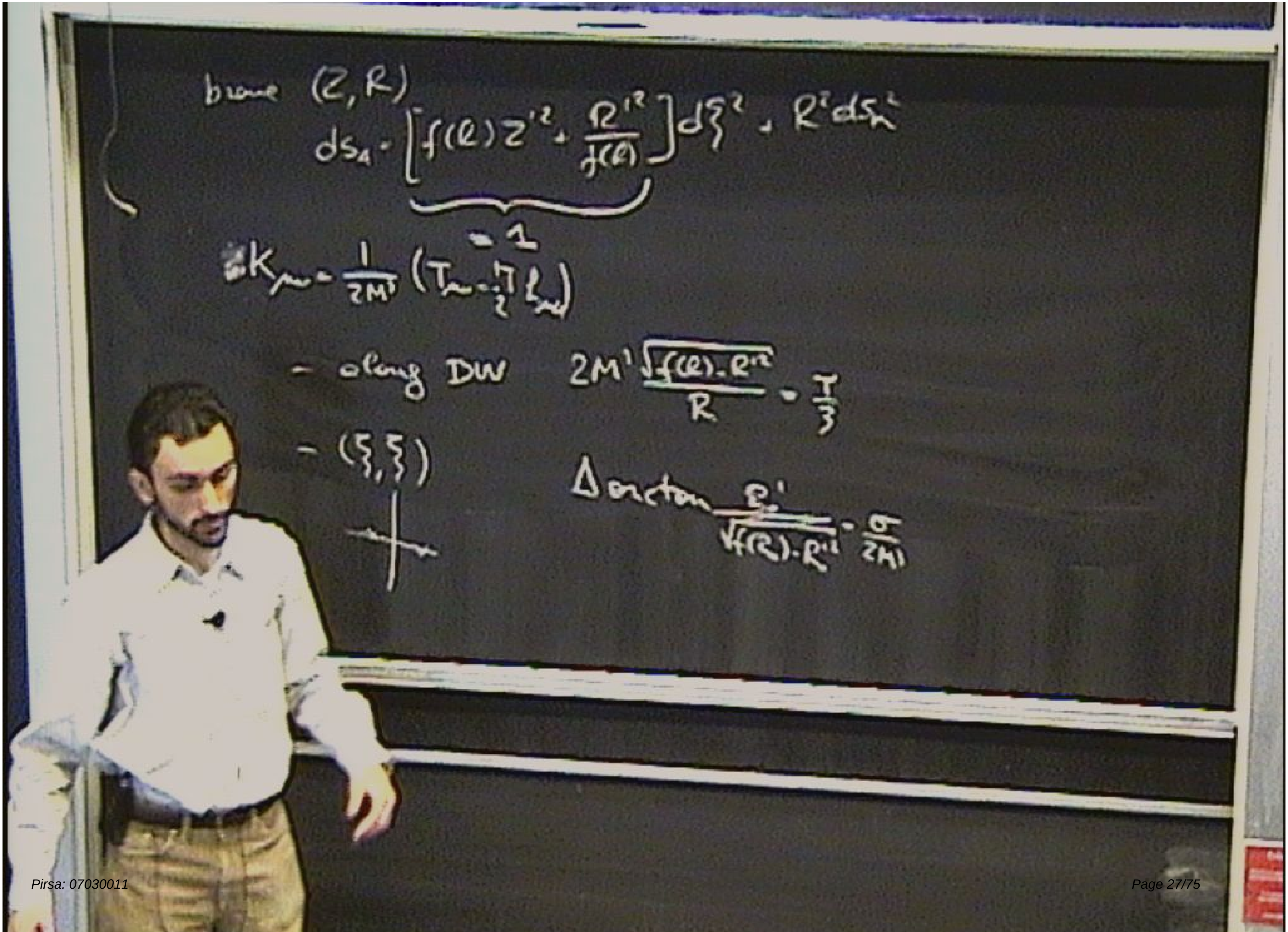

brane (Z,R)
$ds_4 = \left[f(R) Z'^2 + \frac{R'^2}{f(R)} \right] d\xi^2 + R^2 d\Omega_n^2$

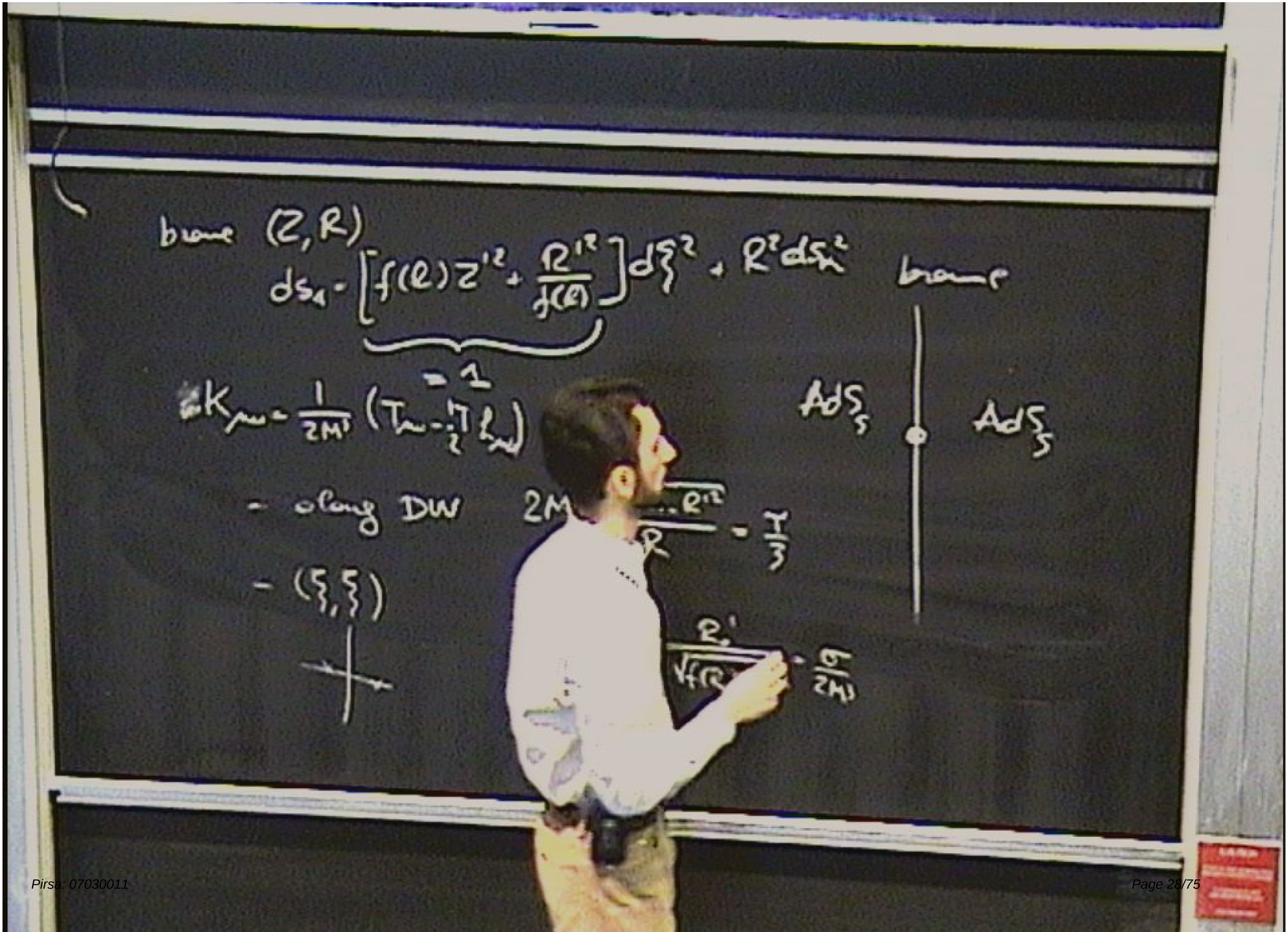

Prelude DW in 4D
$\sigma \to H$
$H(\sigma) = \frac{\sigma}{4M_{pl}^2}$
$ds^2_{4D} = d\xi^2 + R^2(\xi)\, ds_3^2$
dS_3
$R(\xi) = |\xi| - \frac{1}{H}$

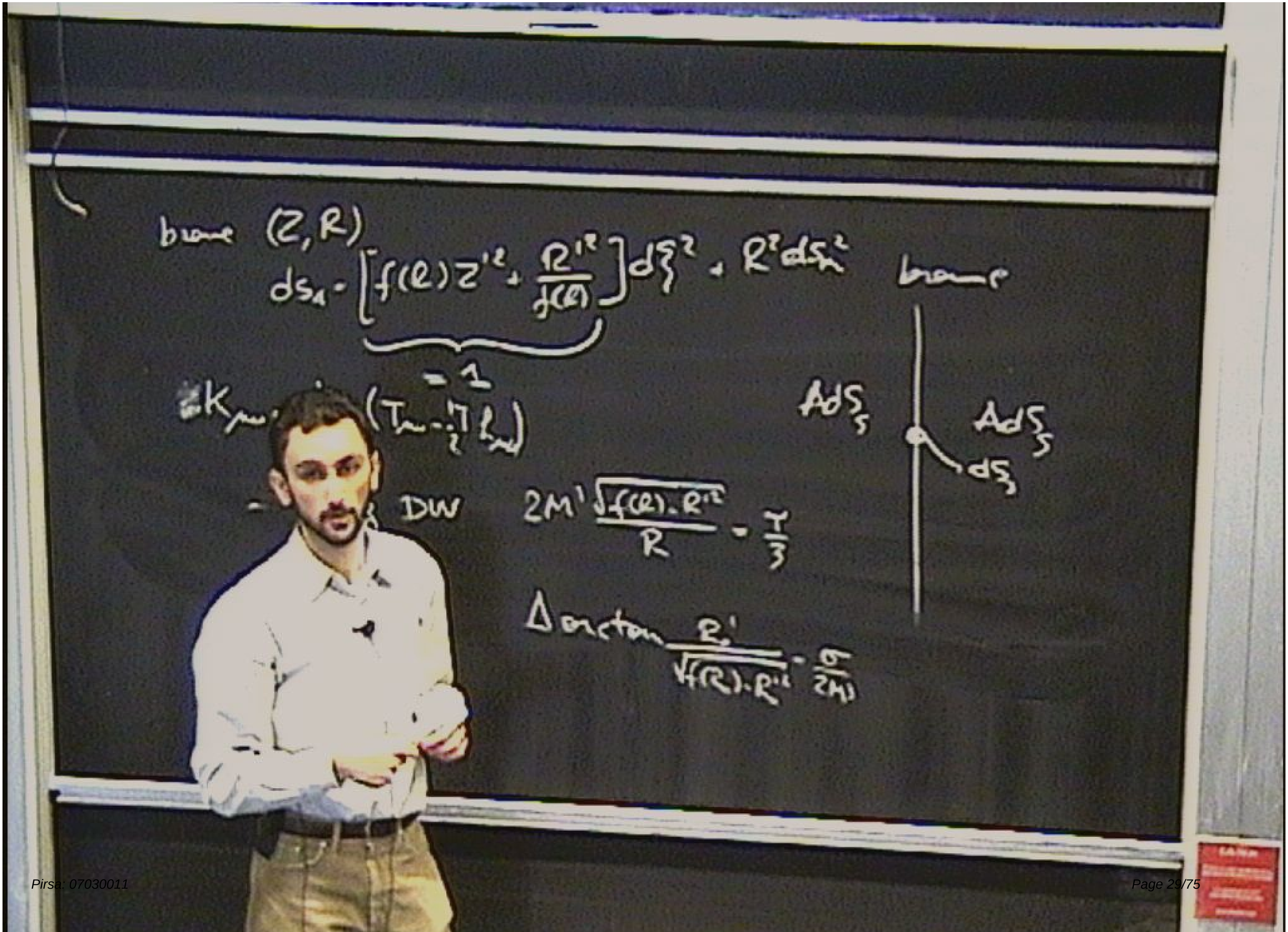

brane (Z,R)
$ds_4 = \left[f(R) Z'^2 + \frac{R'^2}{f(R)} \right] d\xi^2 + R^2 d\Omega_n^2$


brane (Z,R)
ds4 = [f(R) Z'² + R'²/f(R)] dξ² + R² dΩ²
= 1
K_μν = 1/2M³ (T_μν − T/2 g_μν)

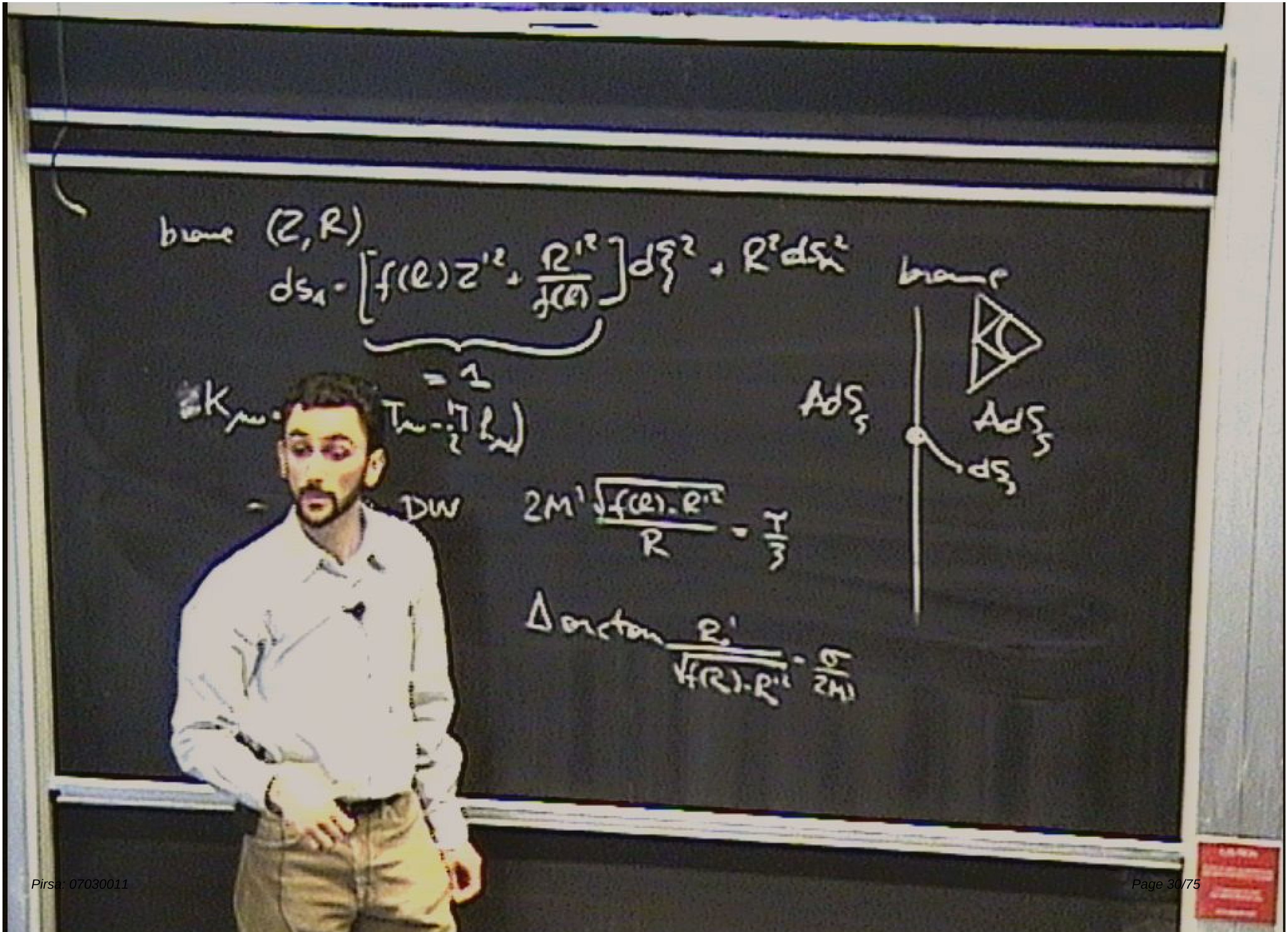

brane (Z,R)
ds4 = [f(R) Z'2 + R'2/f(R)] dξ2 + R2 dΩ2
= 1
Kμν = 1/2M3 (Tμν - T/2 gμν)
- along DW 2M3 √(f(R) - R'2)/R = T/3
- (ξ,ξ)
Δ

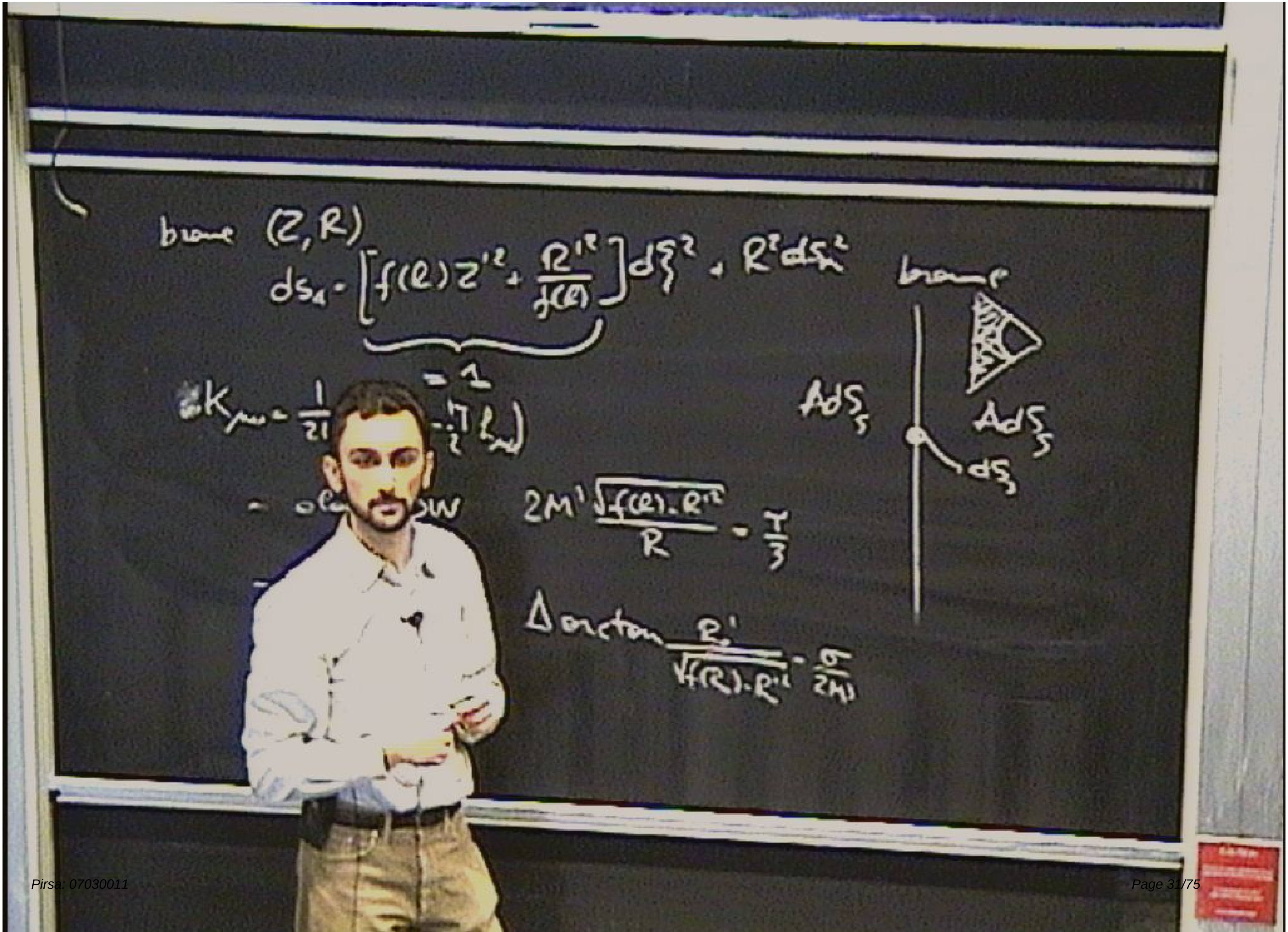

brane (Z, R)
$ds_4 = \left[f(R) Z'^2 + \frac{R'^2}{f(R)} \right] d\xi^2 + R^2 d\Omega_n^2$
$= 1$
$K_{\mu\nu} = \frac{1}{2M^3} \left(T_{\mu\nu} - \frac{T}{2} g_{\mu\nu} \right)$
– along DW
$2M^3 \frac{\sqrt{f(R) - R'^2}}{R} = \frac{T}{3}$
– (ξ, ξ)
Δ across $\frac{R'}{\sqrt{f(R) - R'^2}} = \frac{\sigma}{2M^3}$

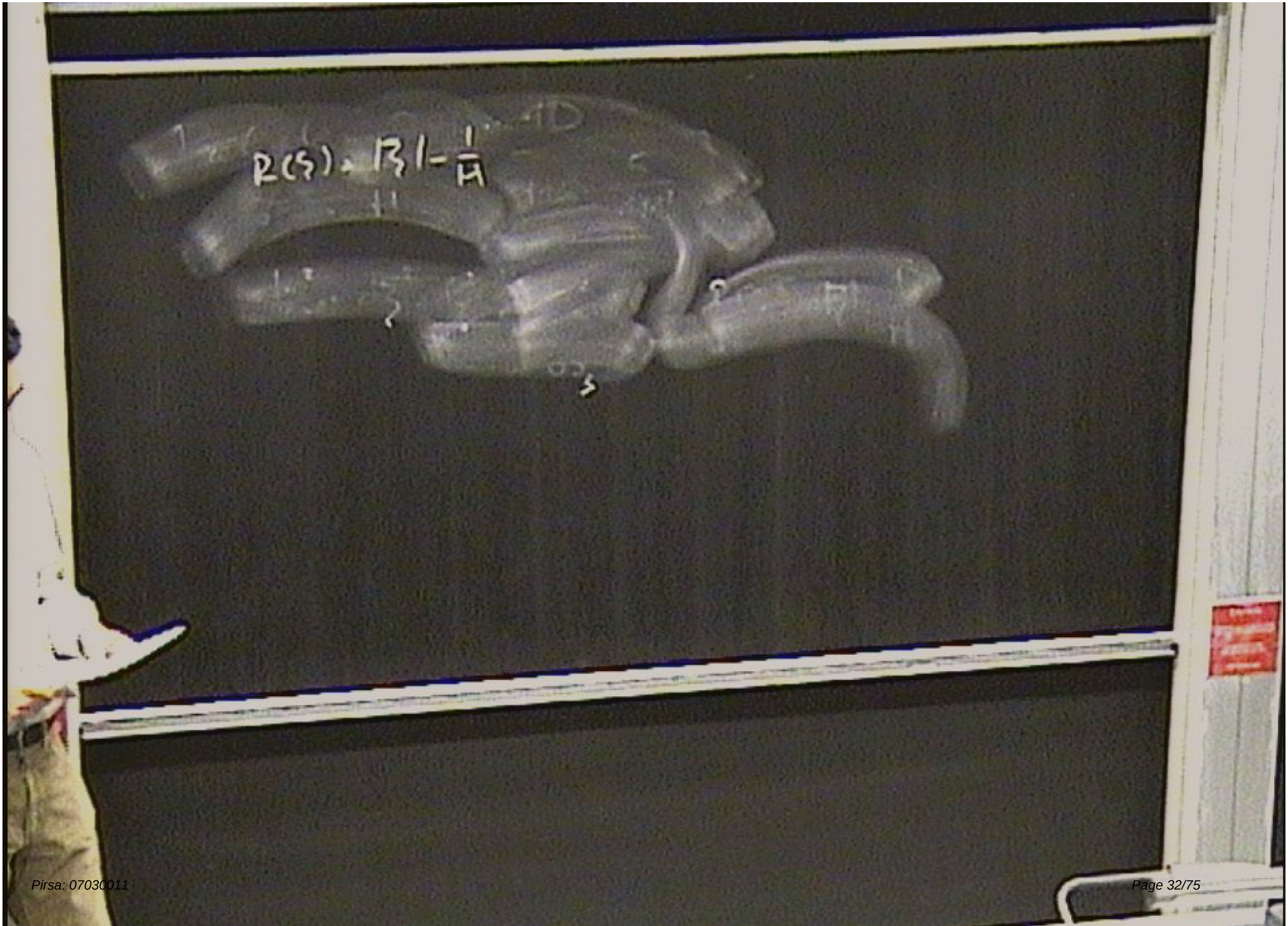

brane (Z,R)
$ds_4 = \left[f(R) Z'^2 + \frac{R'^2}{f(R)} \right] d\xi^2 + R^2 d\Omega^2$
= 1
brane
$K_{\mu\nu} = \frac{1}{2M^3} \left(T_{\mu\nu} - \frac{1}{2} T g_{\mu\nu} \right)$
AdS$_5$
AdS$_5$
- along DW
- (ξ,ξ)
$= \frac{\sigma}{2M^3}$

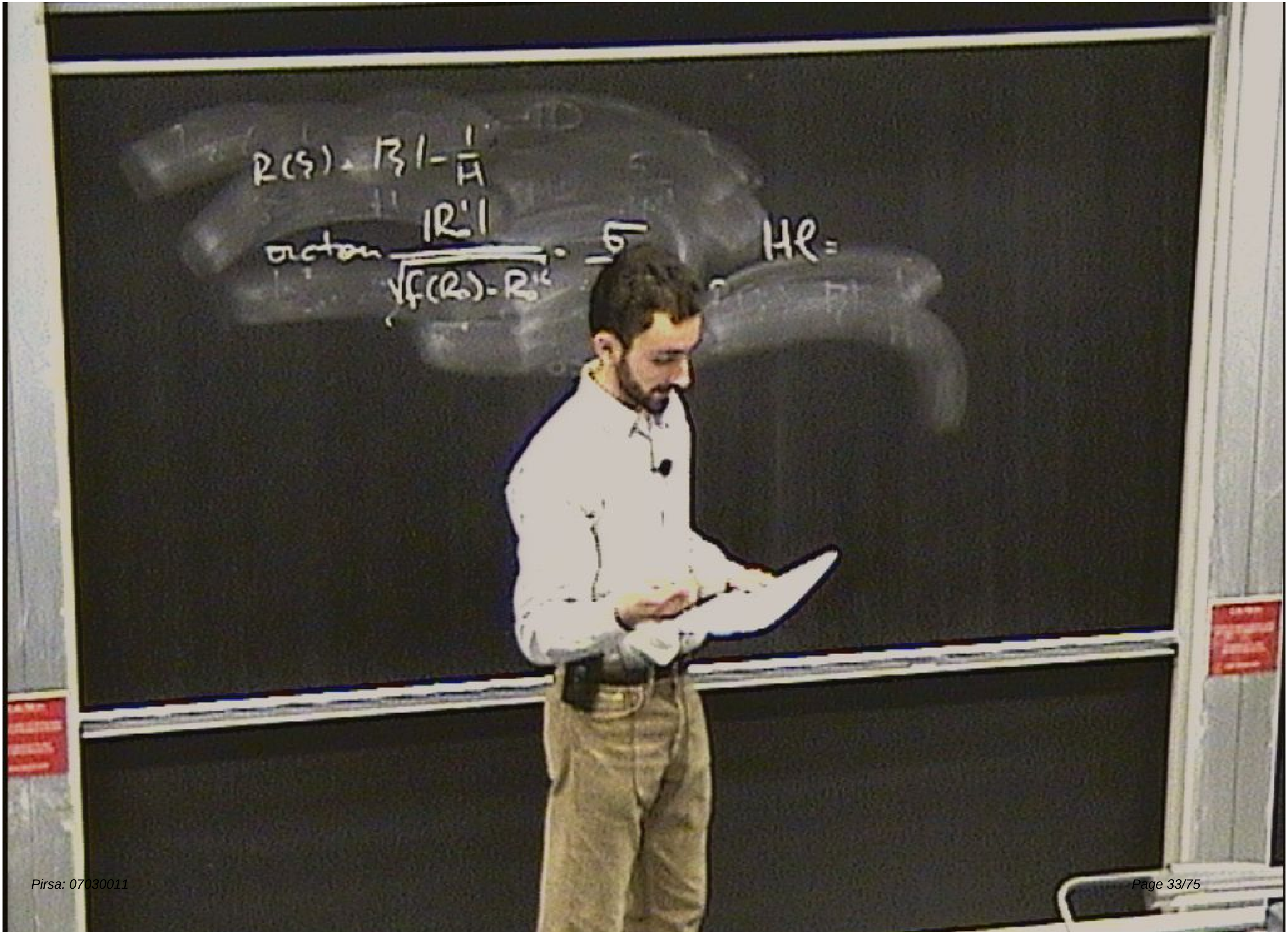


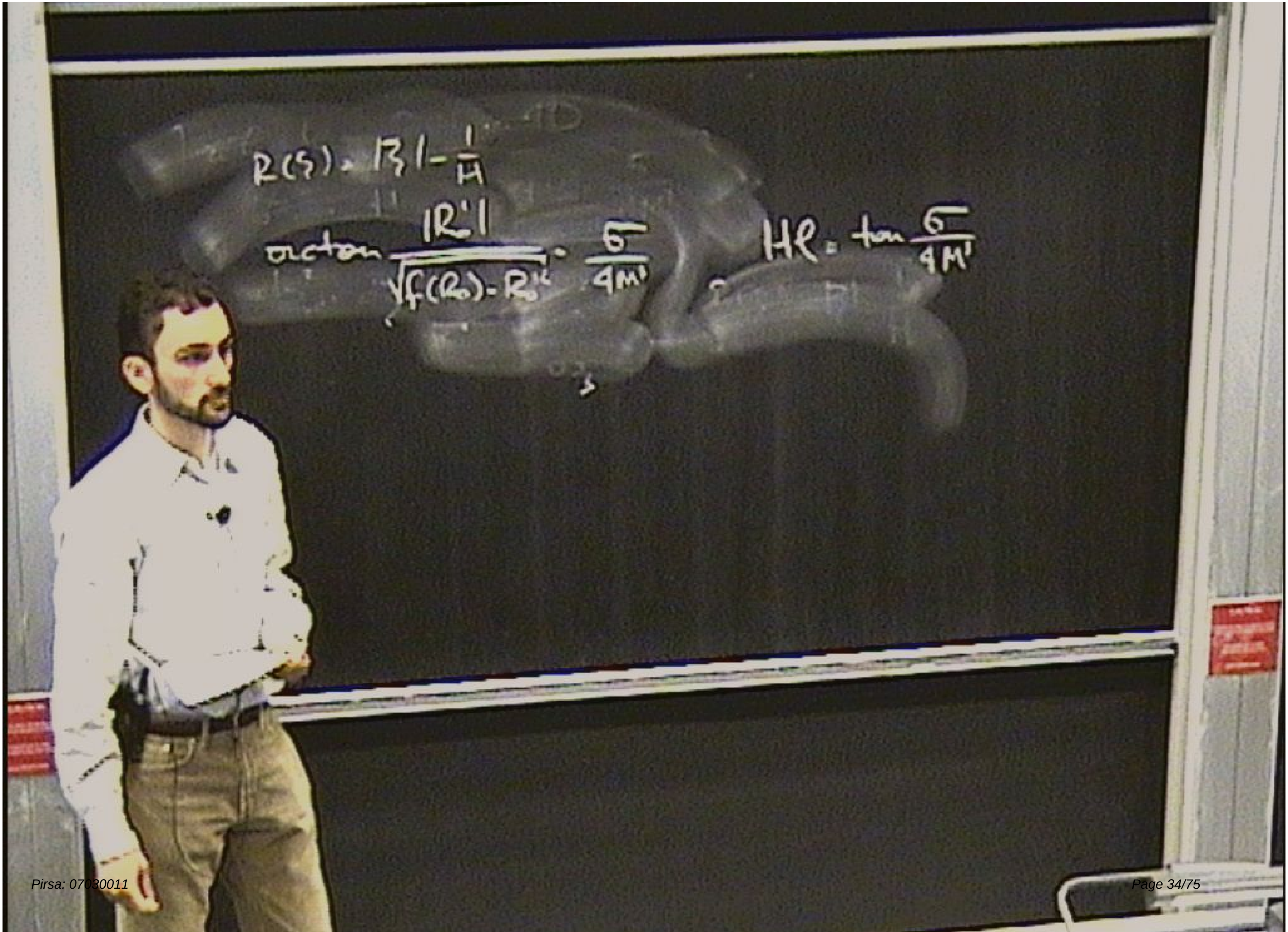
brane (Z,R)
ds4 = [f(R) Z'2 + R'2/f(R)] dξ2 + R2 dΩ2
= 1
brane
AdS5
AdS5
dξ
DW
2M3 √(f(R) + R'2) / R = T/3
Δ arctan R' / √(f(R) + R'2) = σ/2M3

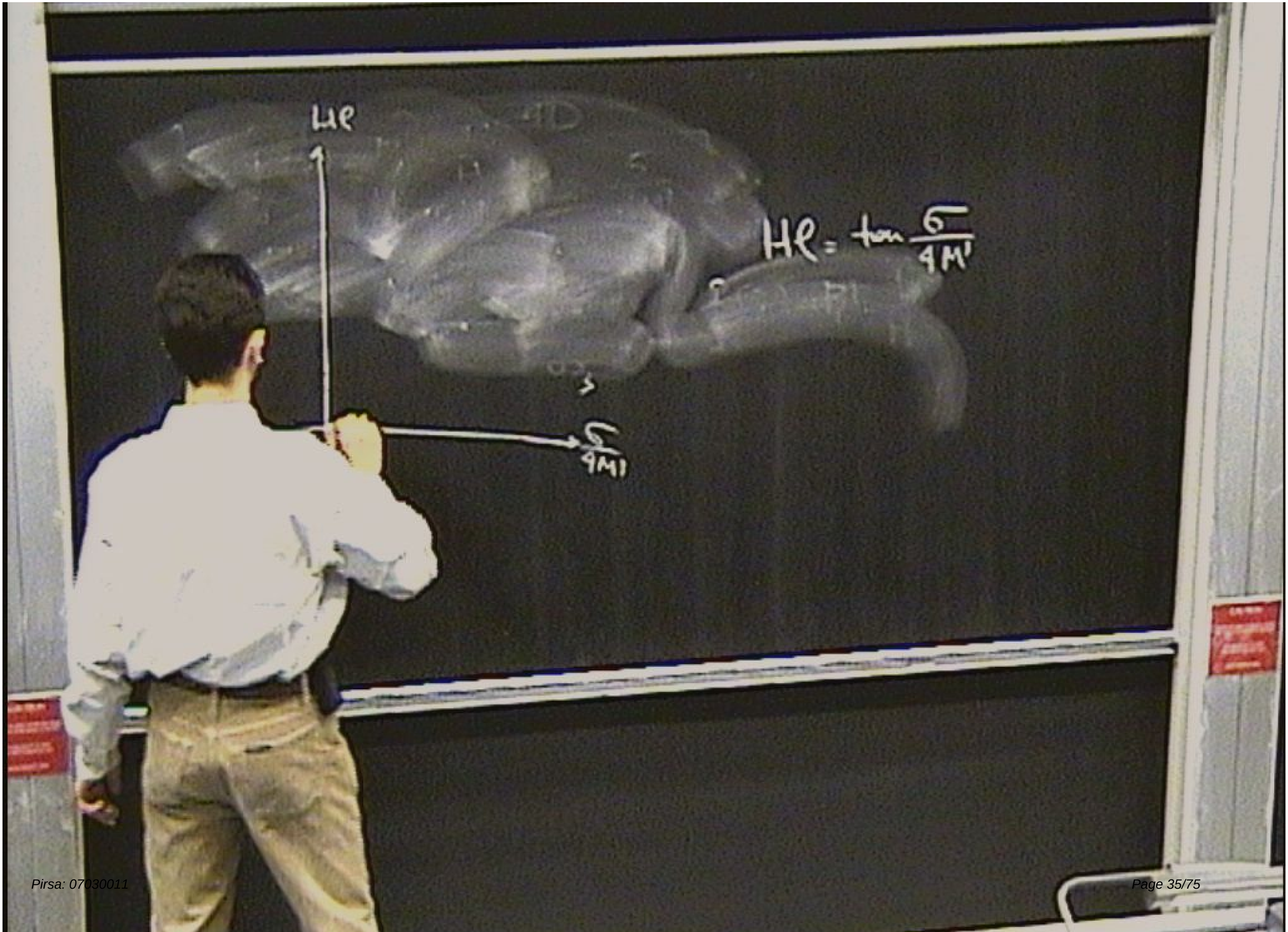

brane (Z,R)
= 1
AdS5
brane
AdS5
dξ
DW

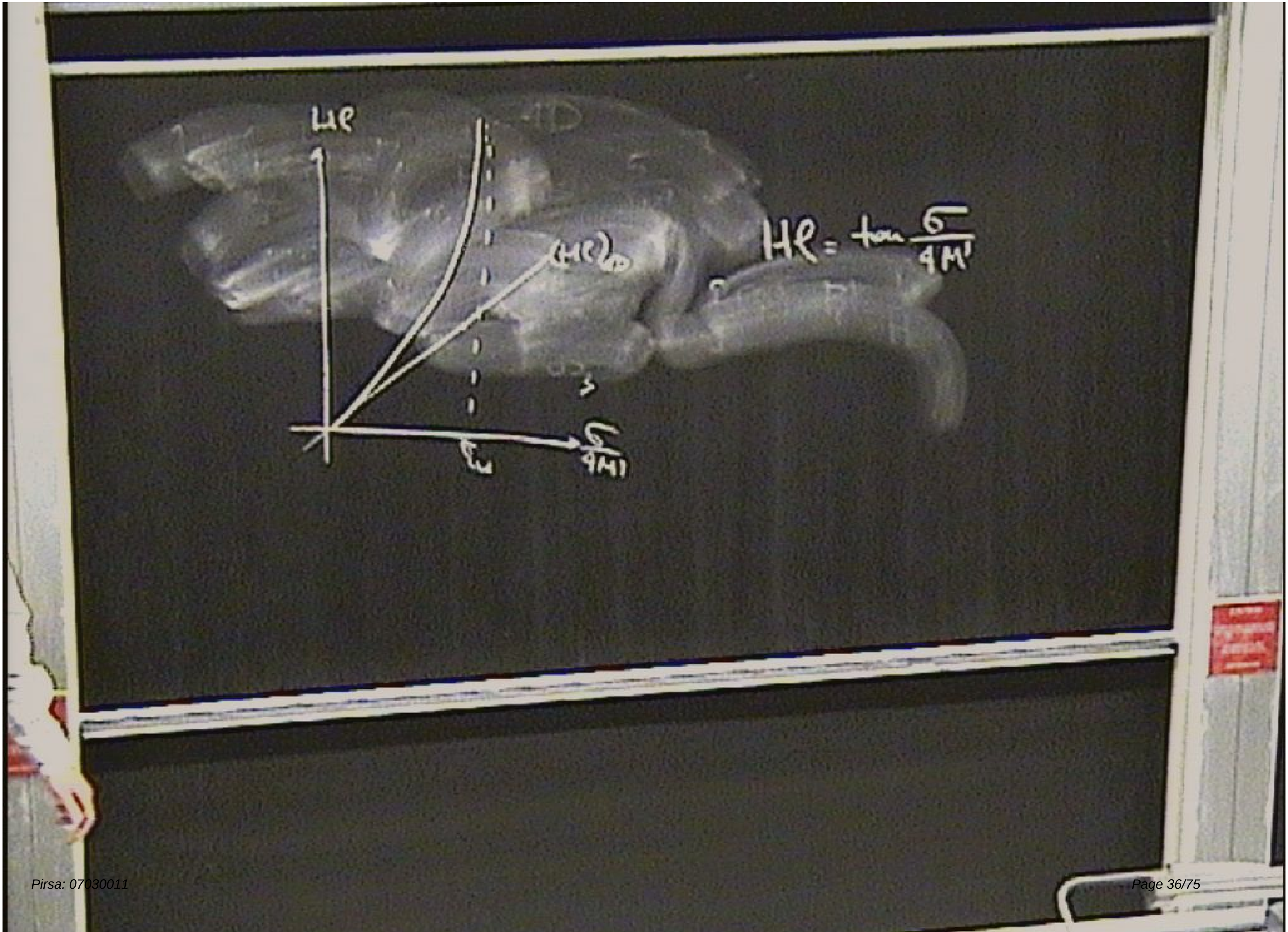

brane (Z,R)
ds4 = [f(R) Z'2 + R'2/f(R)] dξ2 + R2 dΩ2
= 1
brane
AdS5
AdS5
dS3
2M3 √(f(R) - R'2) / R = T/3
Δ arctan R' / √(f(R) - R'2) = σ/2M3

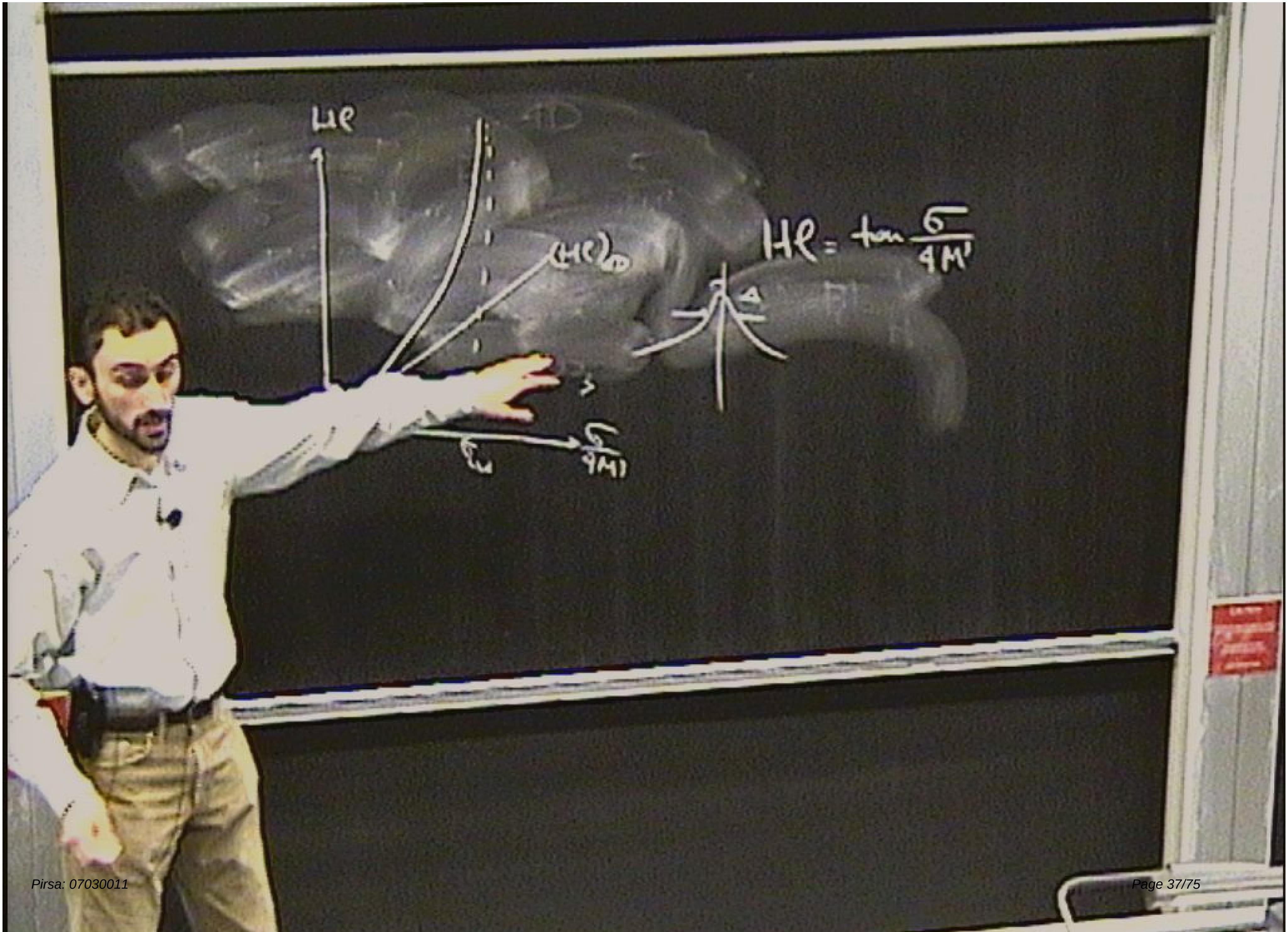


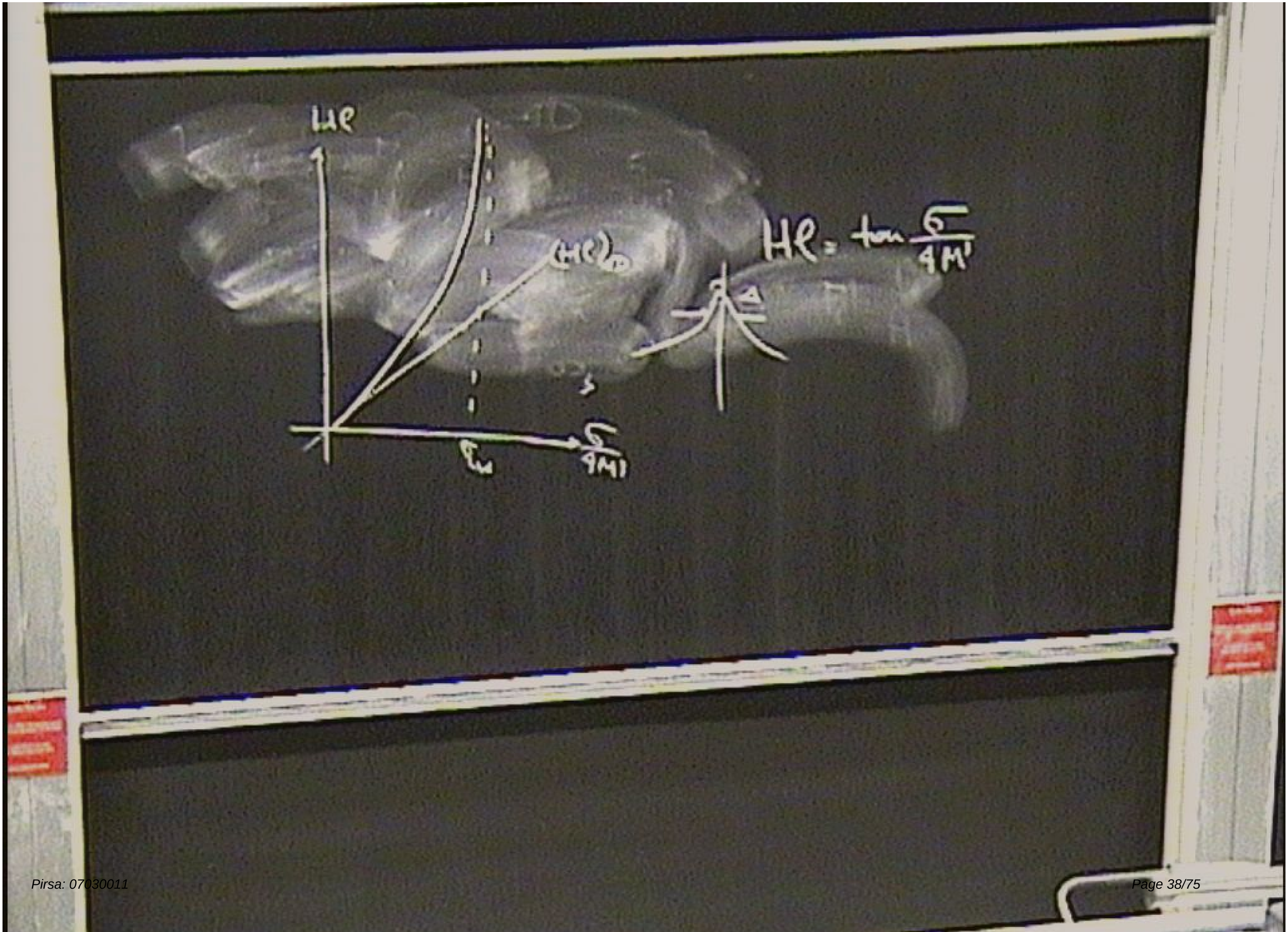


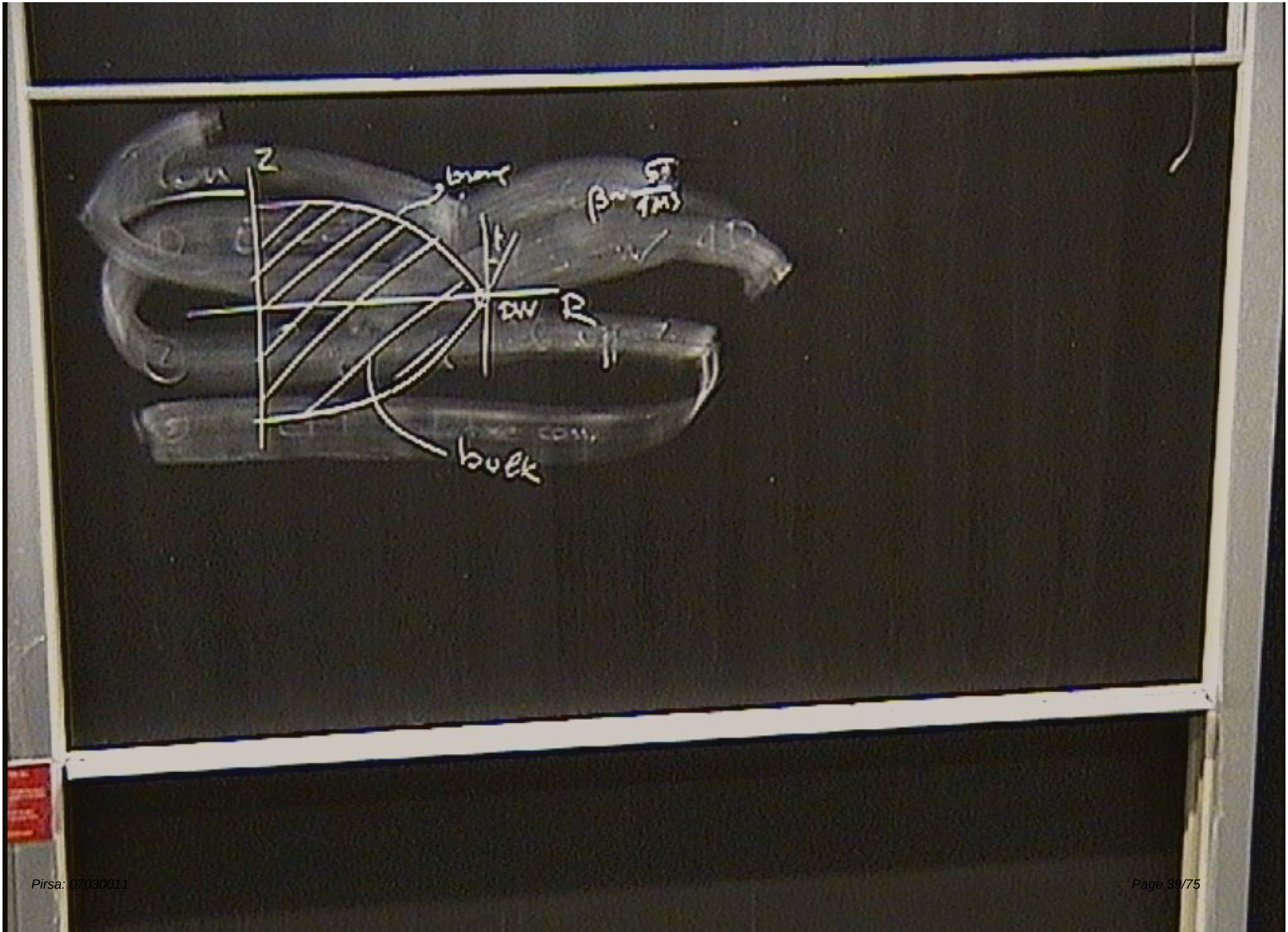

$R(\xi) = R\, 1 - \frac{1}{H}$
$\arctan \frac{|R_0'|}{\sqrt{f(R_0) - R_0'^2}} = \frac{\sigma}{4M'}$
$H\ell = \tan \frac{\sigma}{4M'}$

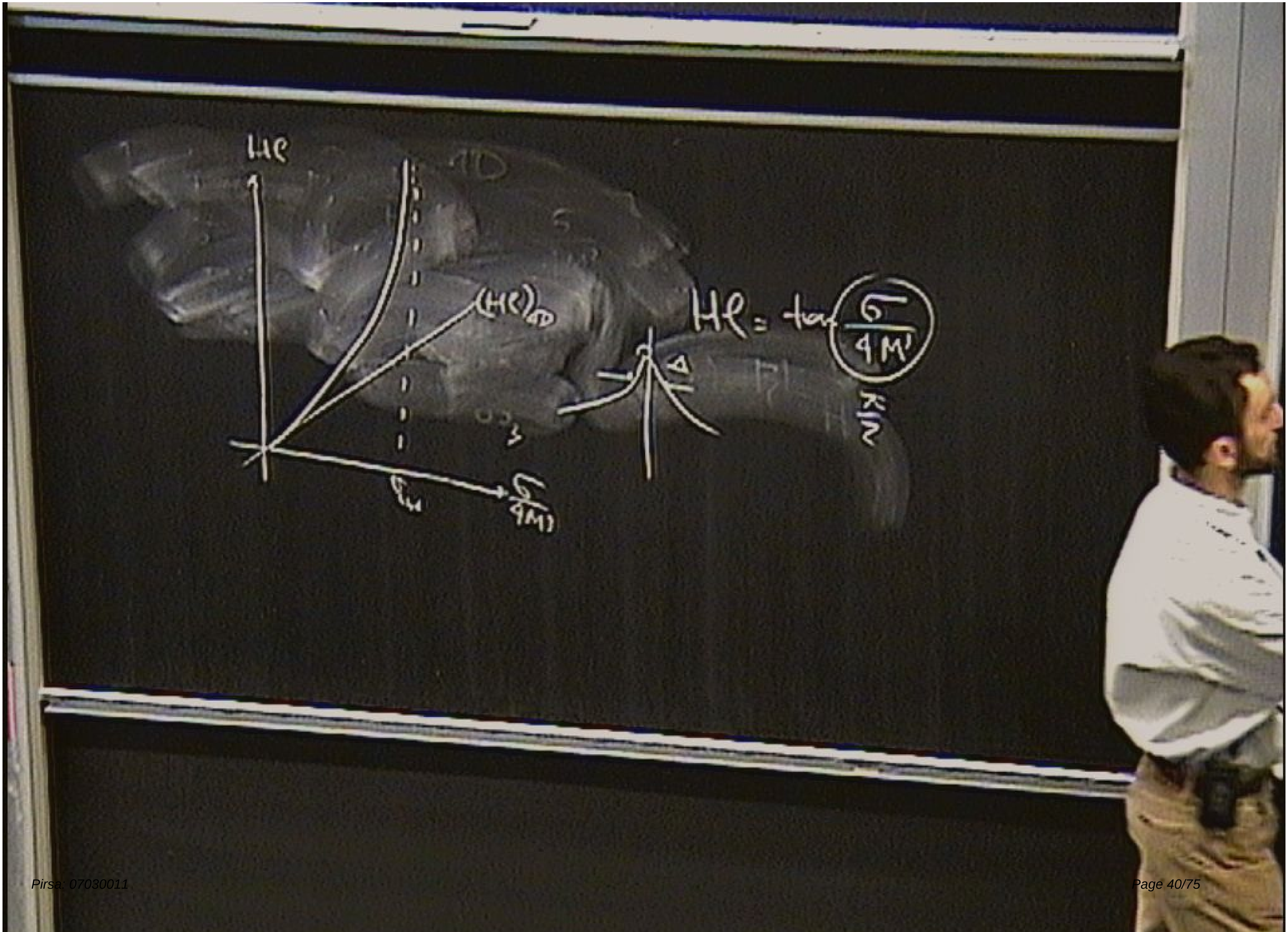

He
He = tan σ/4M'
σ/4M'

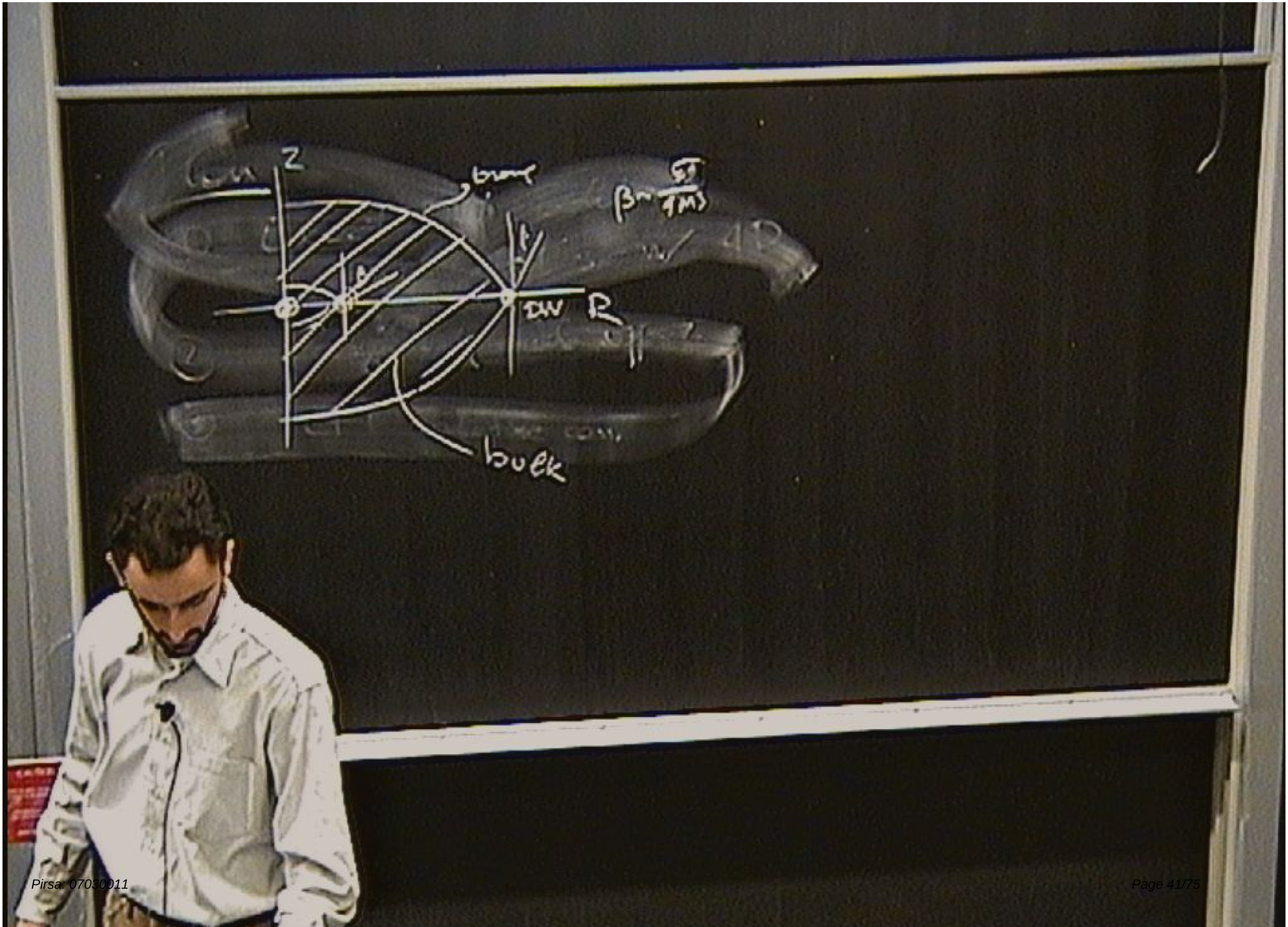

Hℓ
(Hℓ)∞
Hℓ = tan σ/4M'
σ/4M'

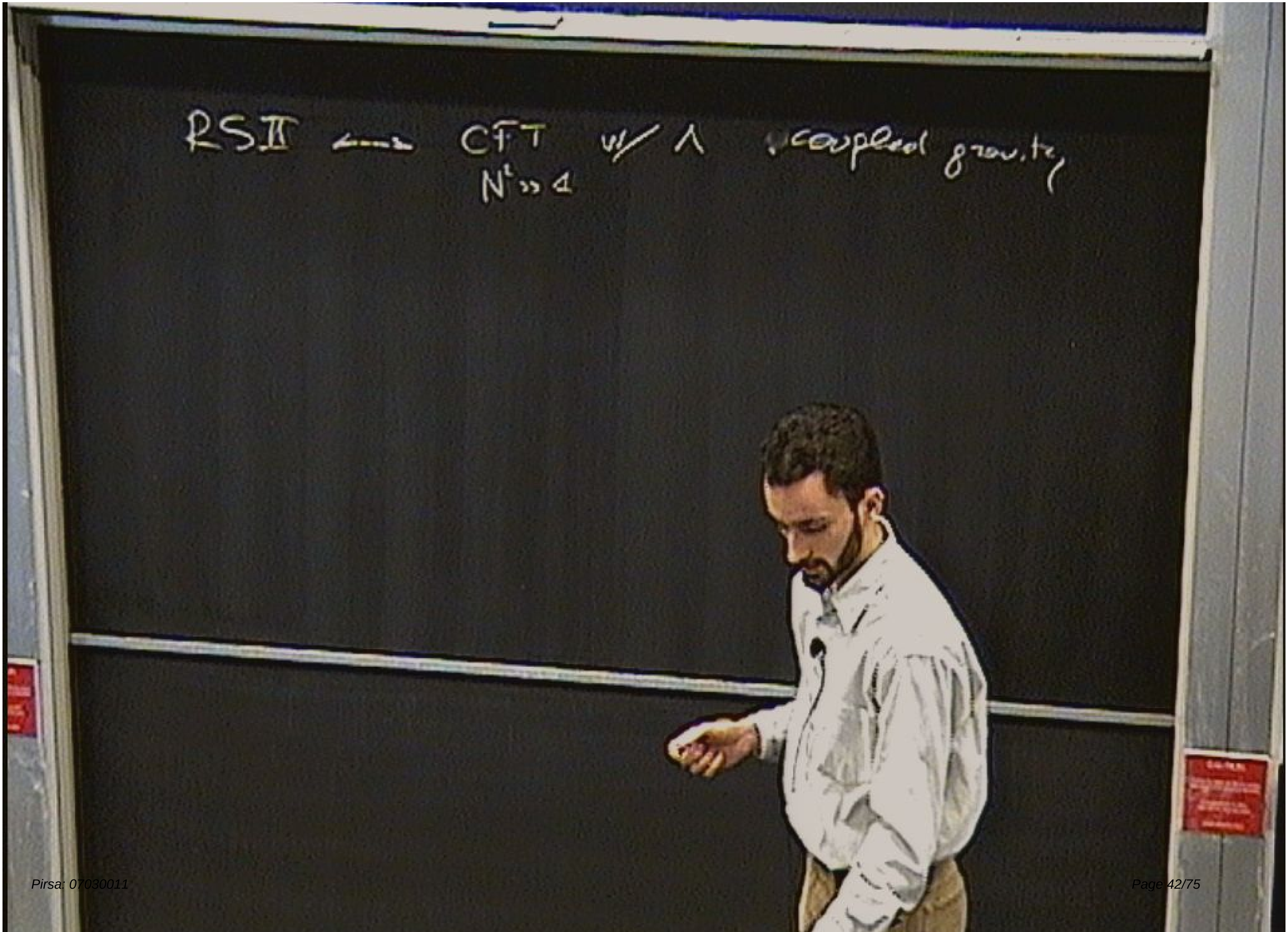

Hℓ
(Hℓ)∞
Hℓ = tan σ/4M'
σ/4M'

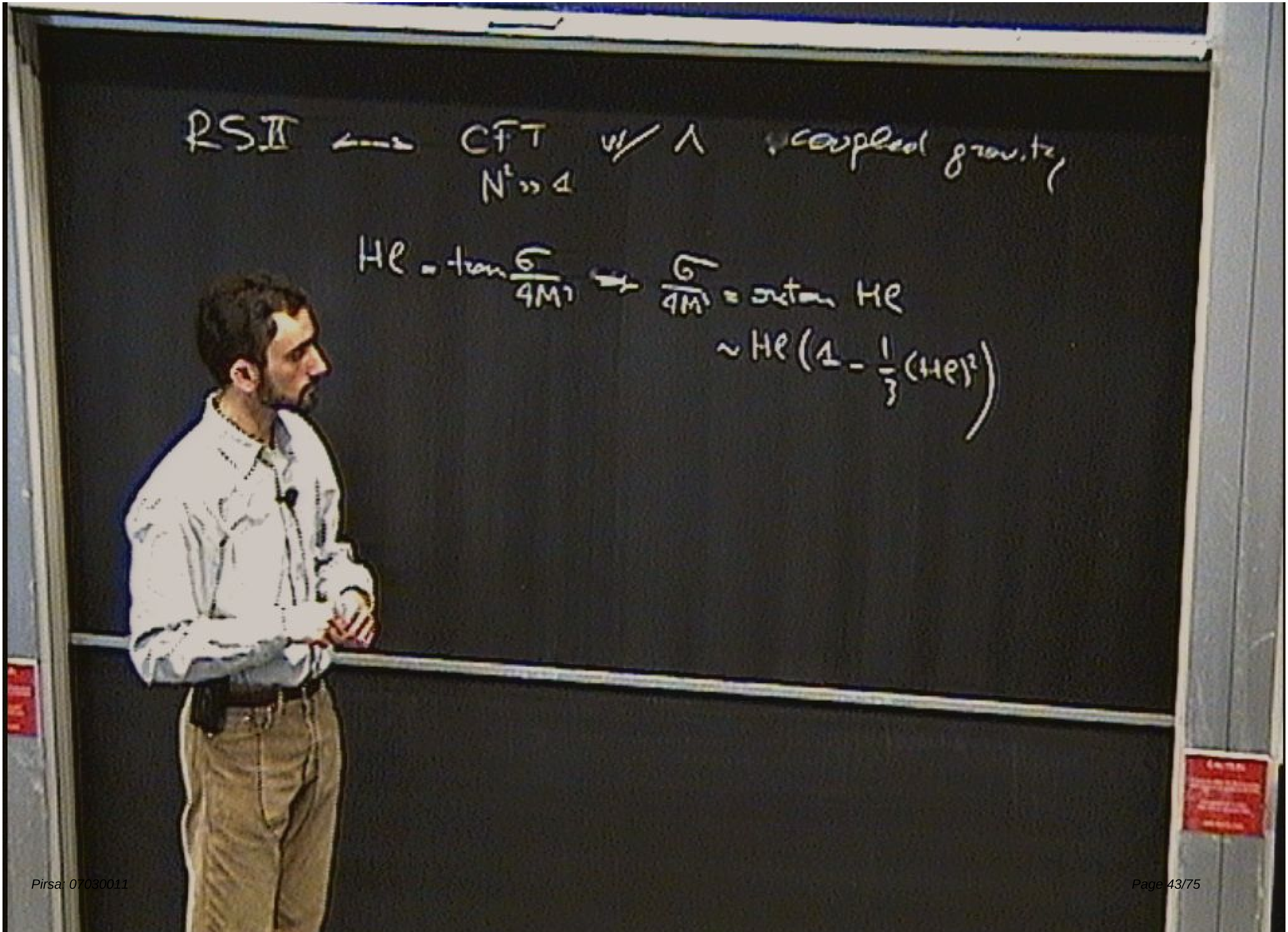



Z
brane
R
DW
bulk


Hℓ
(Hℓ)_4D
Hℓ = tan σ/4M'
π/2
σ/4M'


Z
brane
DW
R
bulk


RS II ⟷ CFT w/ Λ coupled gravity
N² >> 1


RSII ⟷ CFT w/ Λ coupled gravity
N² ≫ 1
Hℓ = tan σ/4M³ ⟹ σ/4M³ = arctan Hℓ
~ Hℓ (1 − 1/3 (Hℓ)²)

RS II $\longleftrightarrow$ CFT w/ Λ coupled gravity

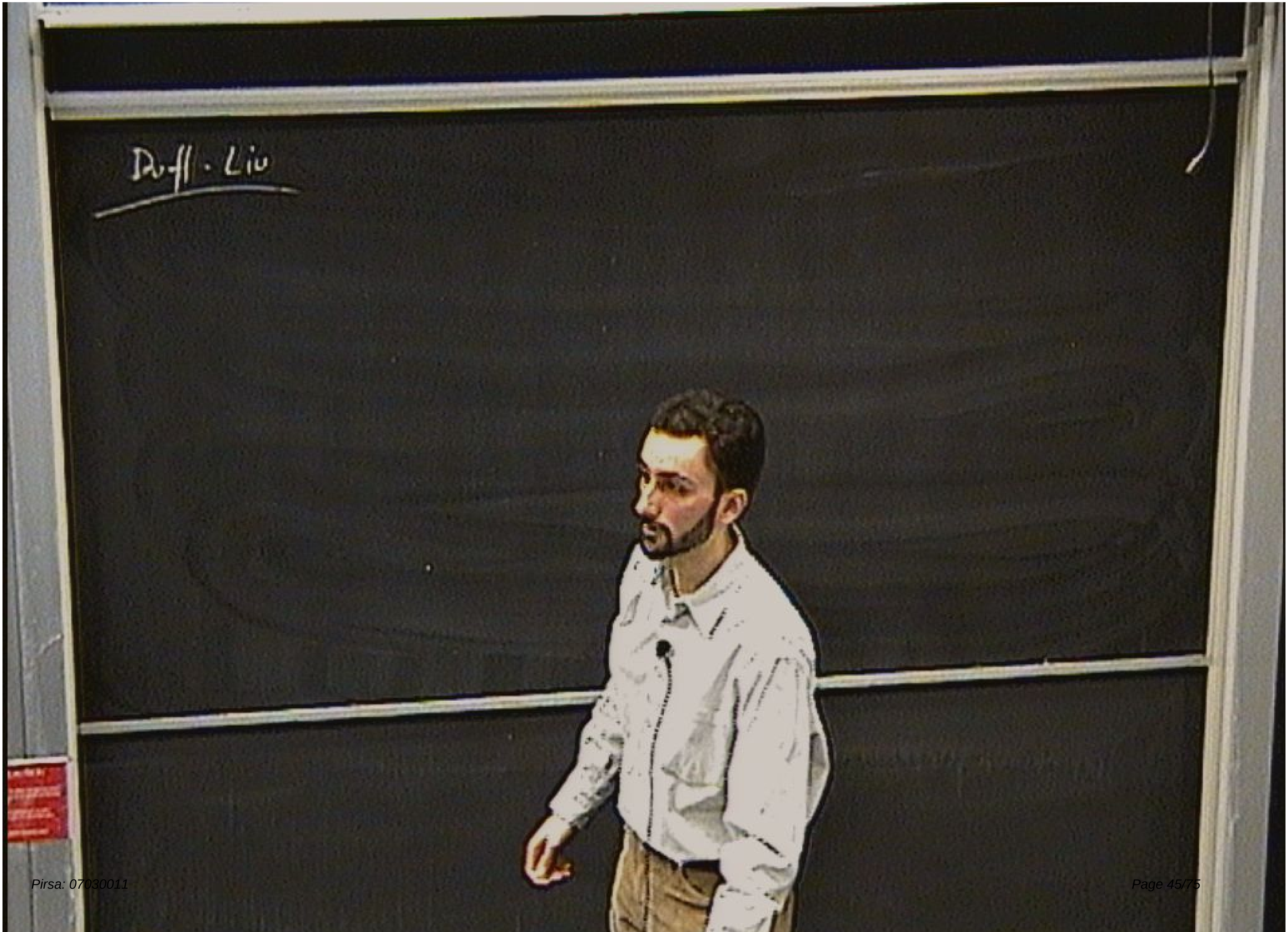
$N^2 \gg 1$

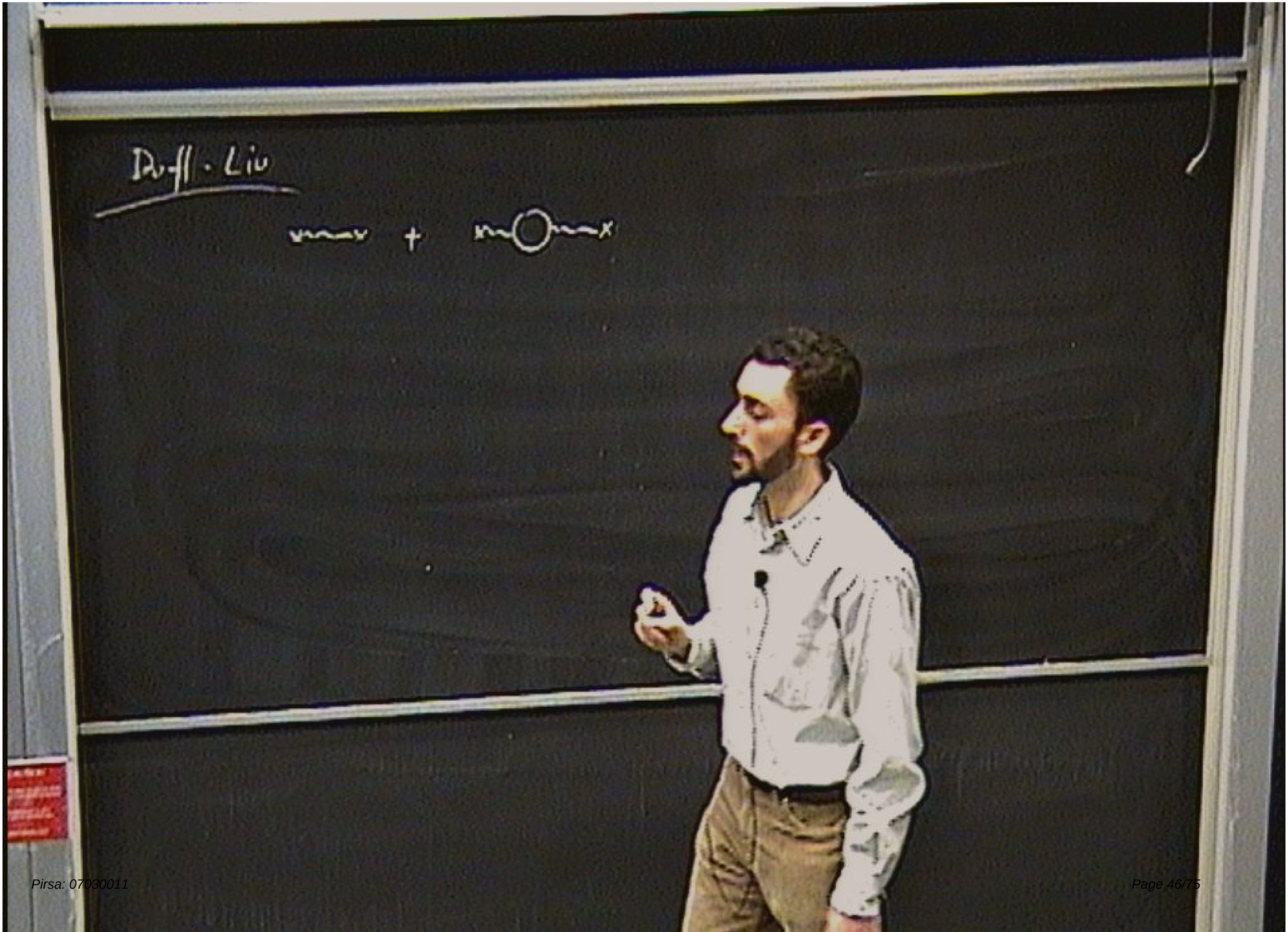
$$H\ell = \tan\frac{\sigma}{4M^3} \Rightarrow \frac{\sigma}{4M^3} = \arctan H\ell$$

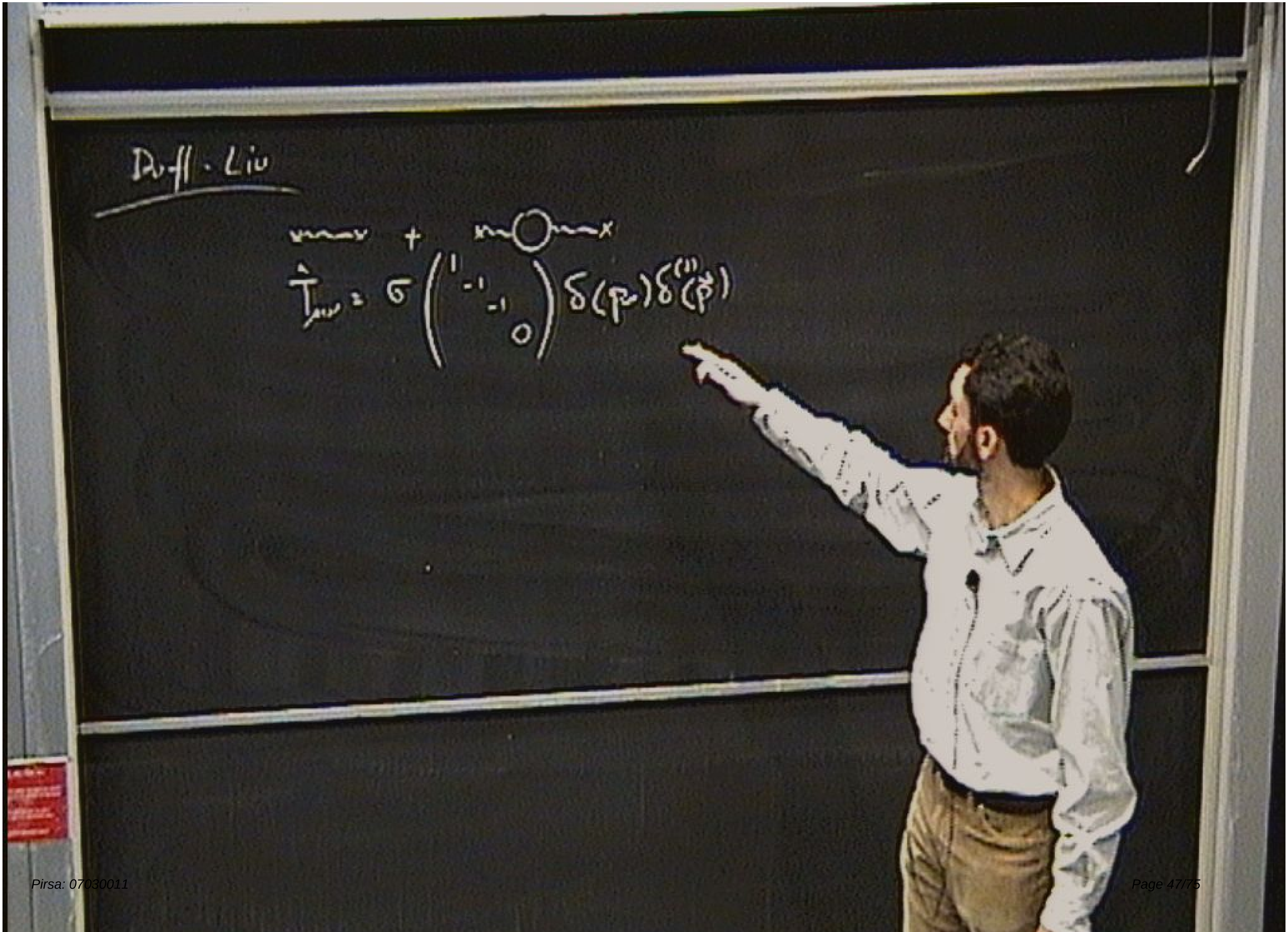
$$\sim H\ell\left(1 - \frac{1}{3}(H\ell)^2\right)$$

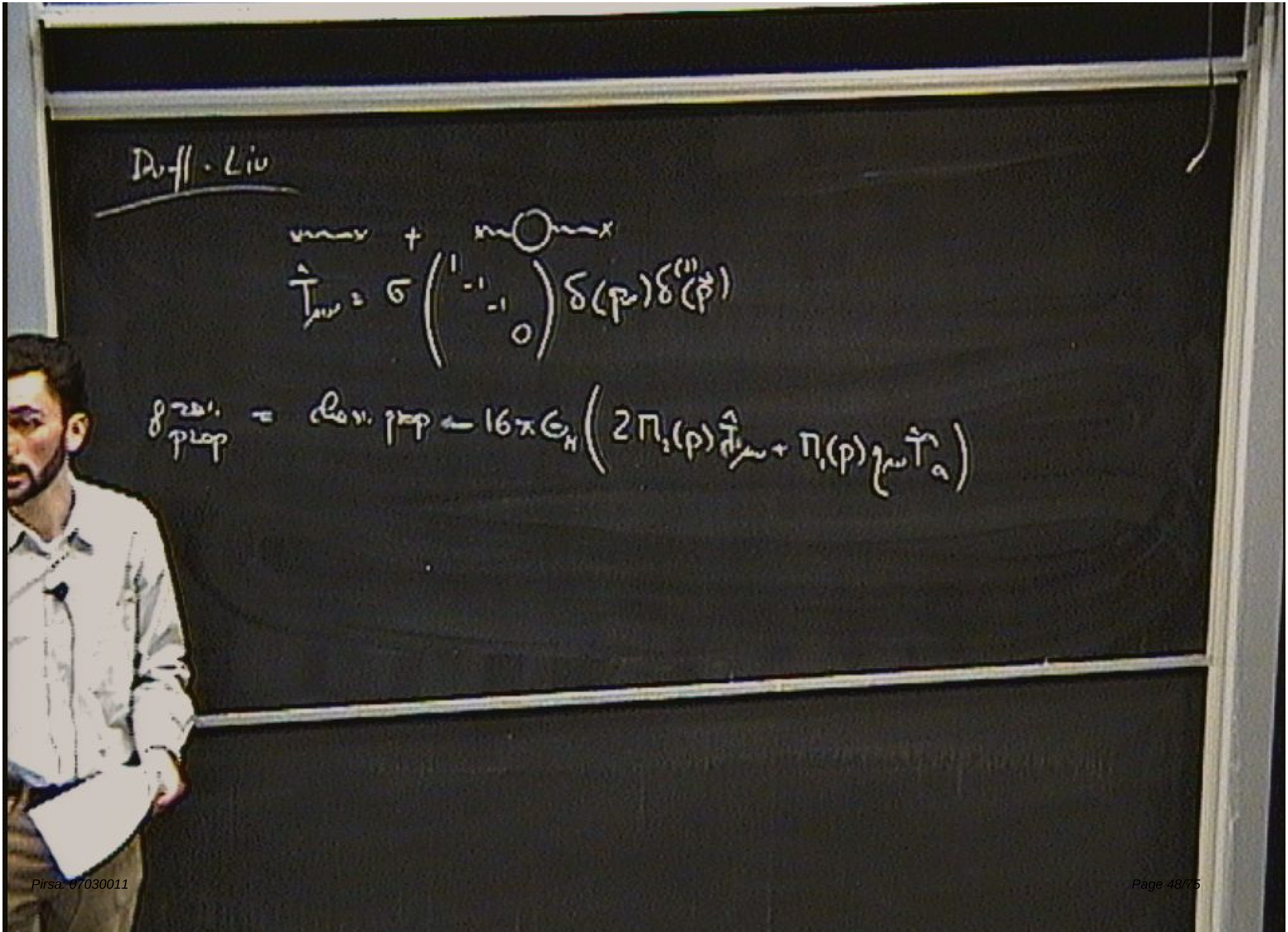
$$\updownarrow$$

$$\mathcal{O}$$


Duff · Liu


Duff · Liu


Duff · Liu

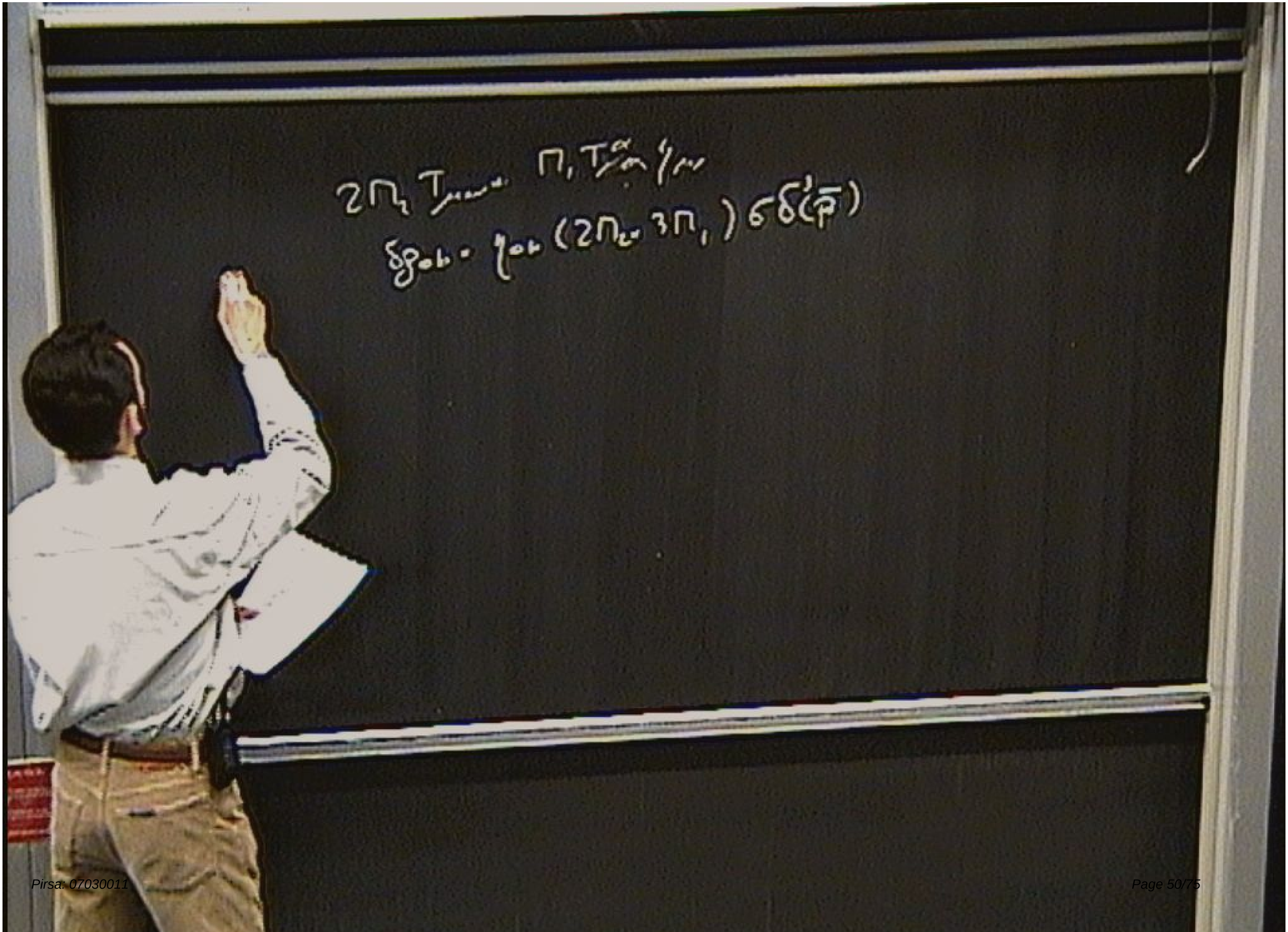

Duff · Liu
$\hat{T}_{\mu\nu} = \sigma \begin{pmatrix} 1 & & & \\ & -1 & & \\ & & -1 & \\ & & & 0 \end{pmatrix} \delta(p_0)\delta^{(3)}(\vec{p})$
$g^{ren.}_{prop} = $ class. prop $- 16\pi G_N \left(2\Pi_2(p)\hat{T}_{\mu\nu} + \Pi_1(p)\eta_{\mu\nu}\hat{T}^a_a \right)$

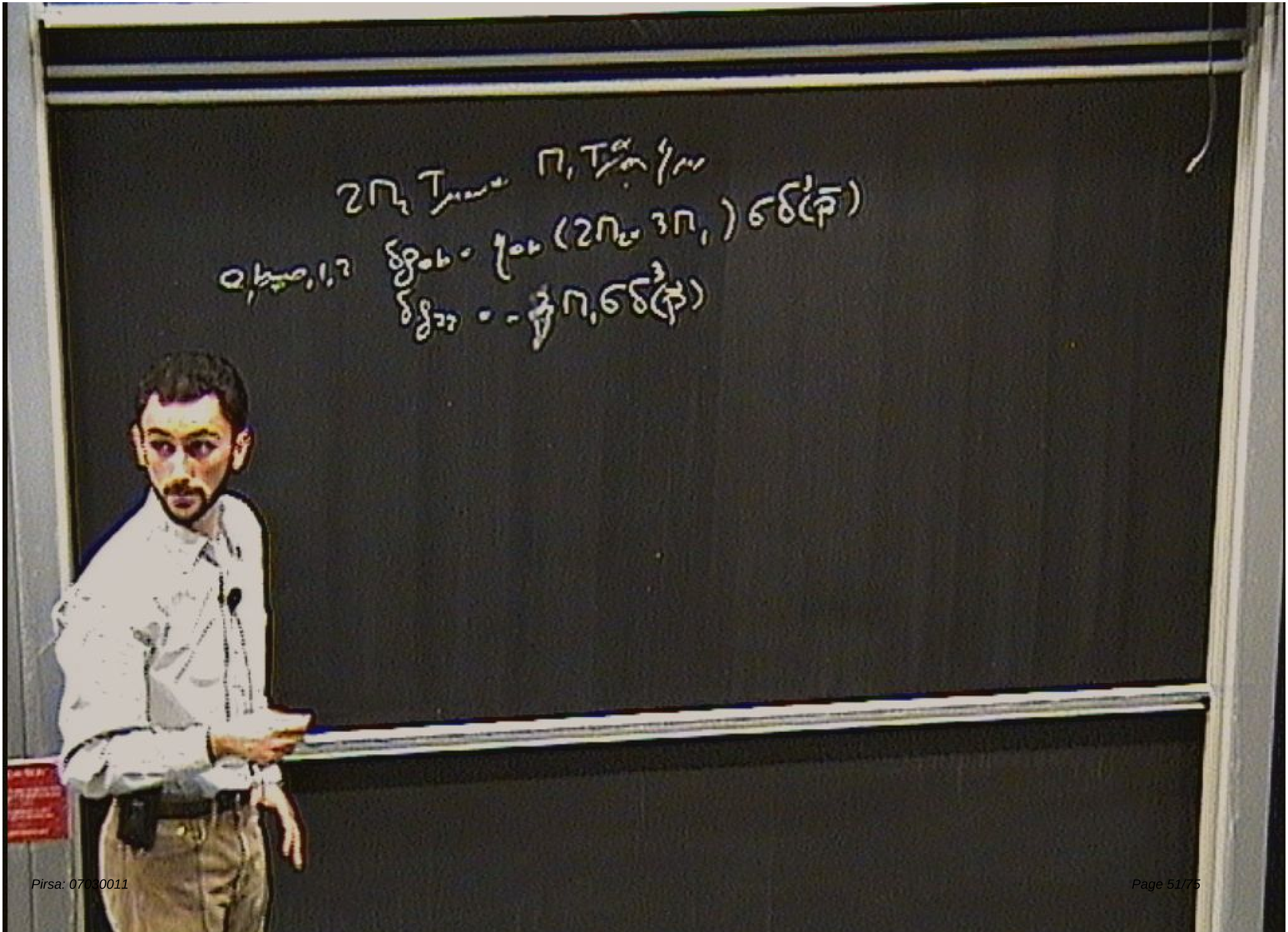
Duff - Liu

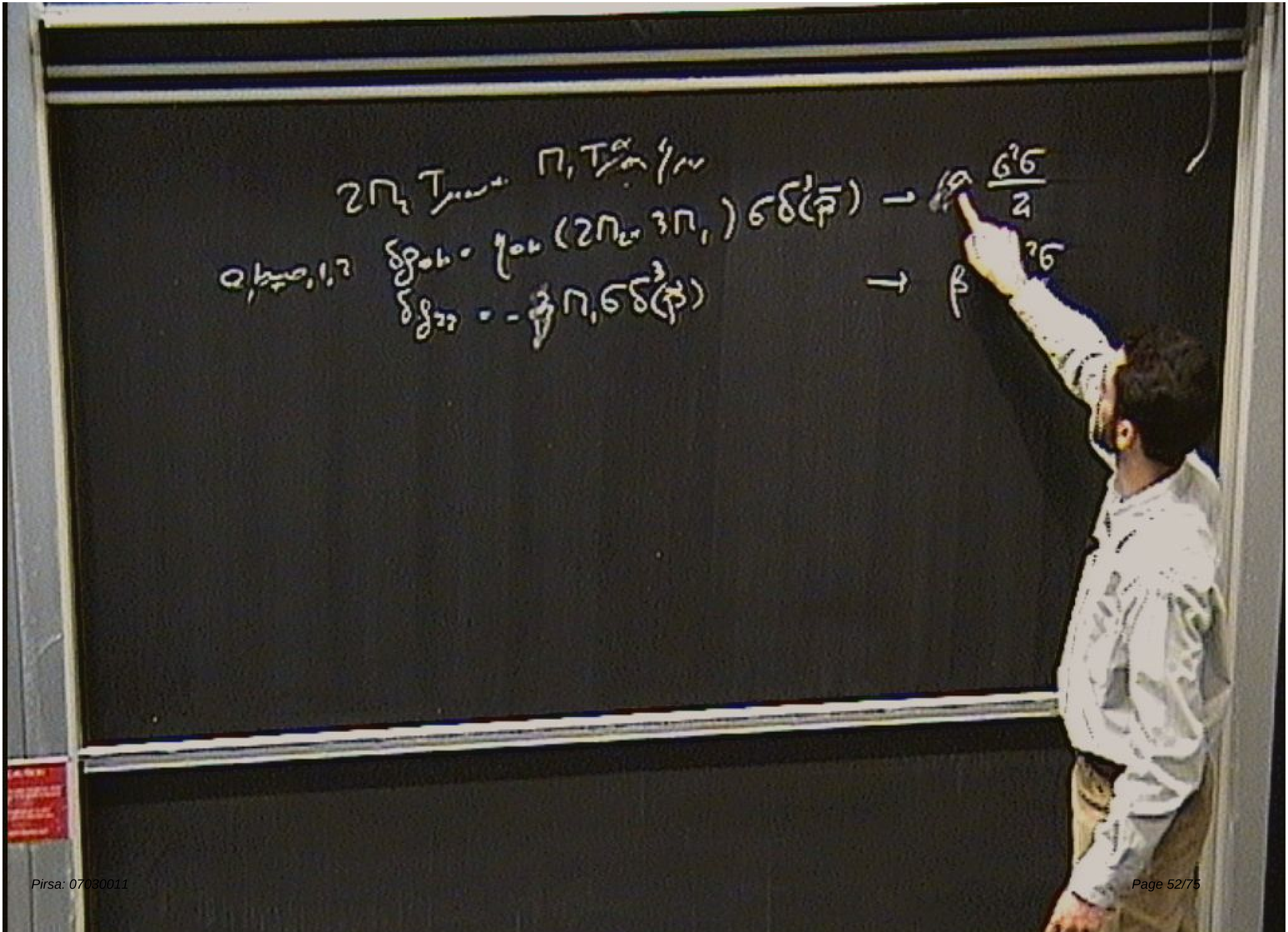
$$\hat{T}_{\mu\nu} = \sigma \begin{pmatrix} 1 & & & \\ & -1 & & \\ & & -1 & \\ & & & 0 \end{pmatrix} \delta(p_\mu)\,\delta^{(1)}(\vec{p})$$

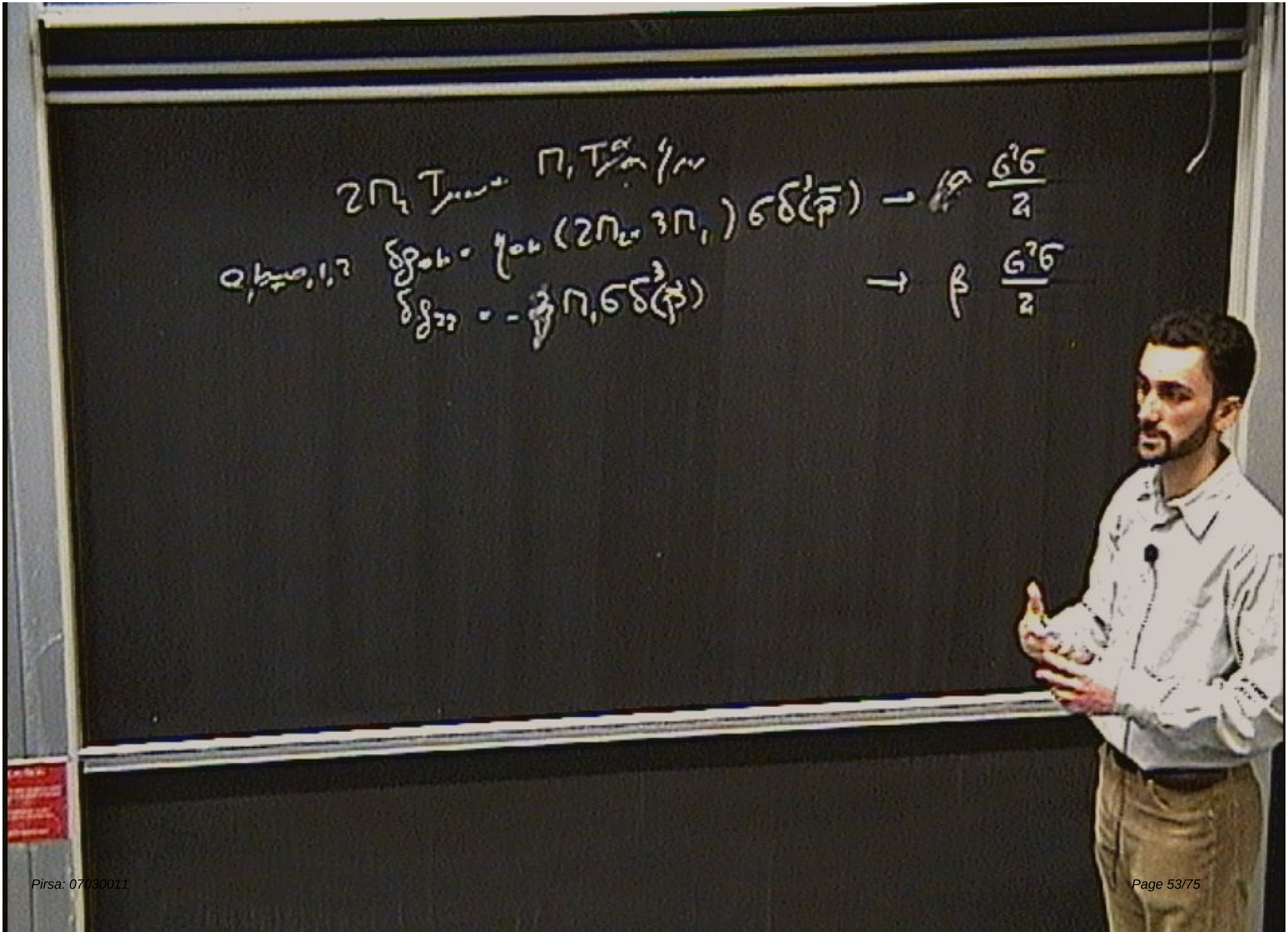
$$g^{\text{ren.}}_{\text{prop}} = \text{class. prop} - 16\pi G_N \left(2\Pi_2(p)\hat{T}_{\mu\nu} + \Pi_1(p)\eta_{\mu\nu}\hat{T}^{\alpha}_{\alpha} \right)$$

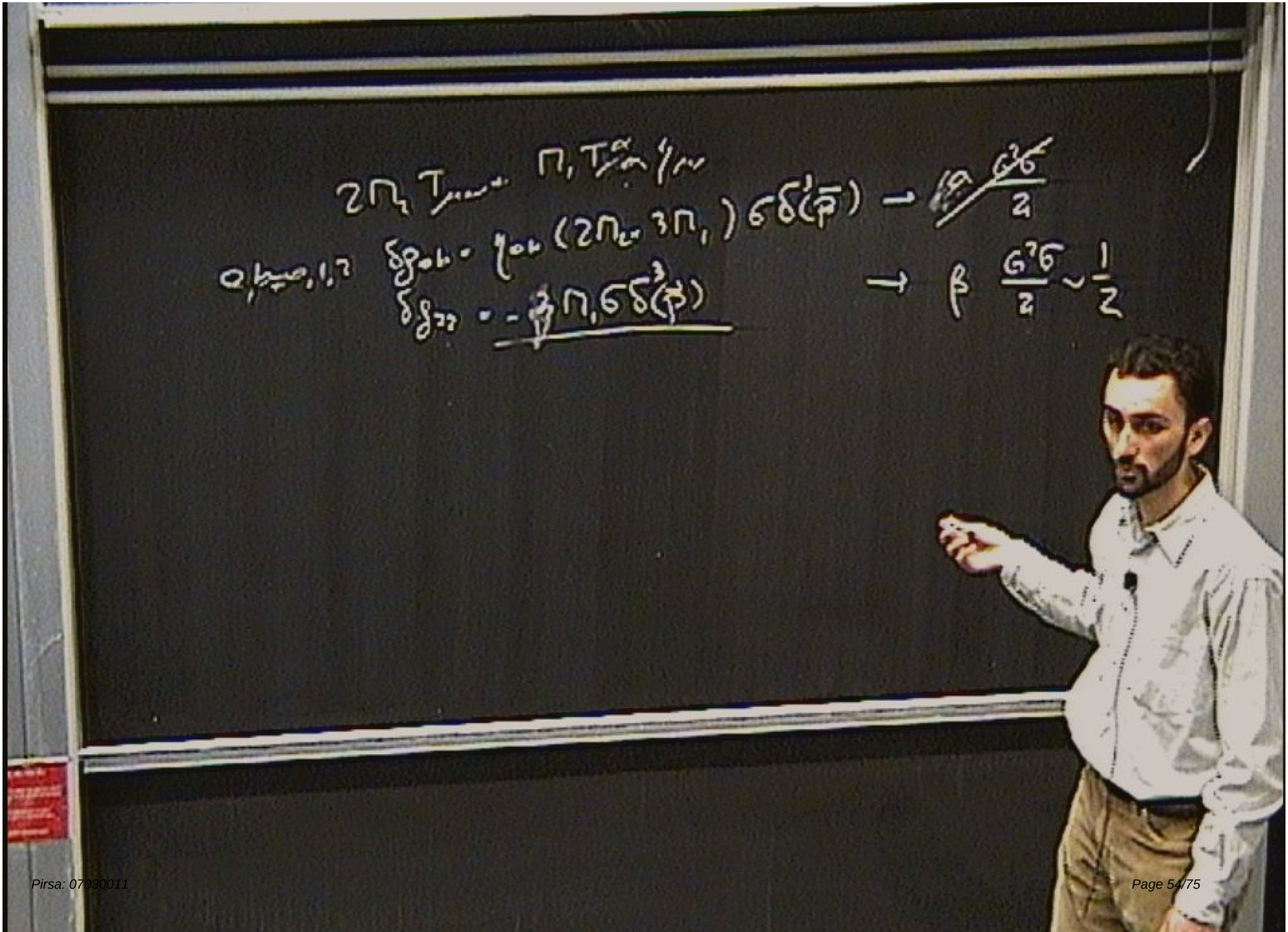
$$\Pi_i(p) = 32\pi G_N \left[a_i \ln\frac{p^2}{\mu^2} + b_i \right]$$

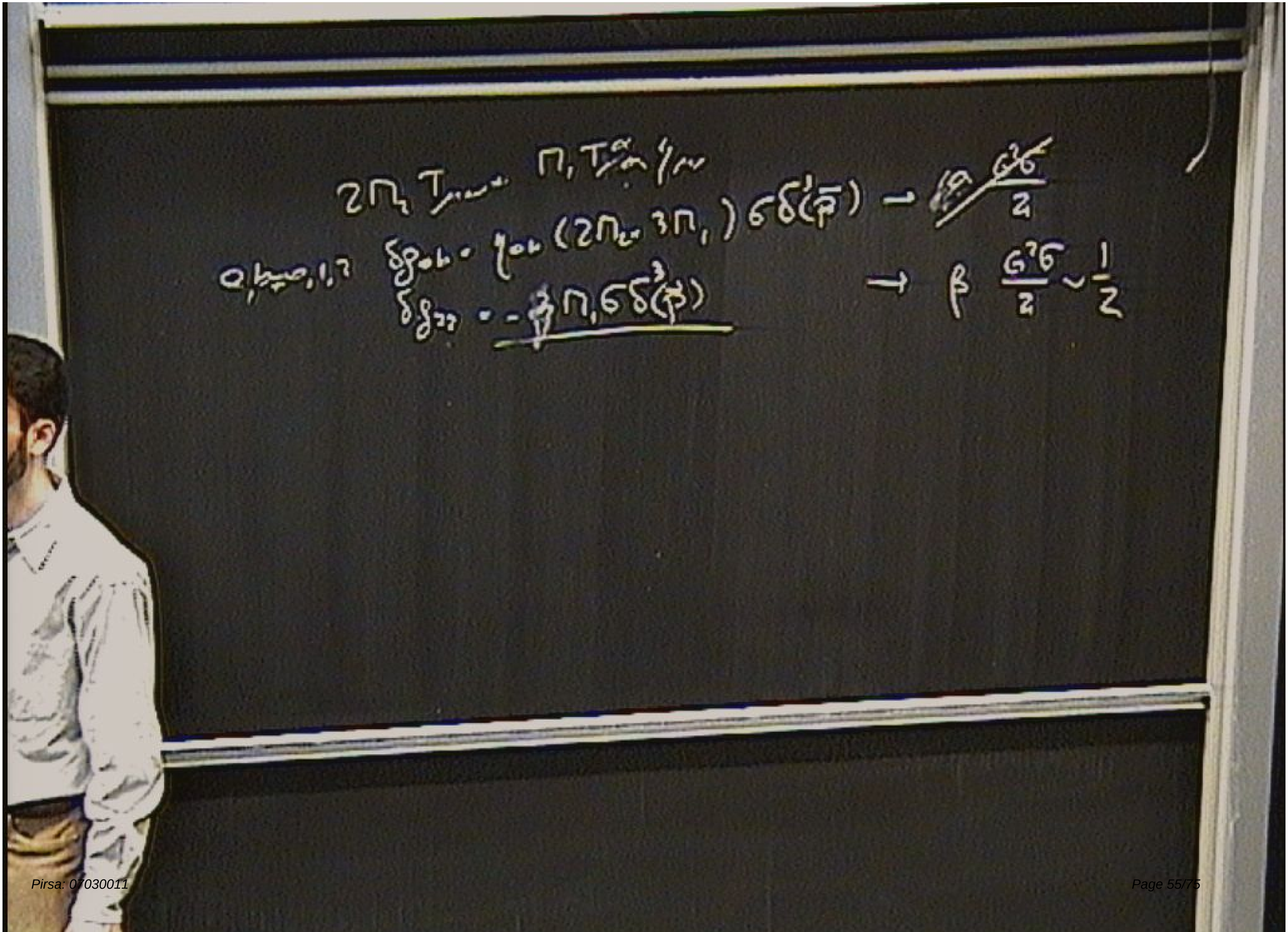












RS II $\longleftrightarrow$ CFT w/ Λ coupled gravity

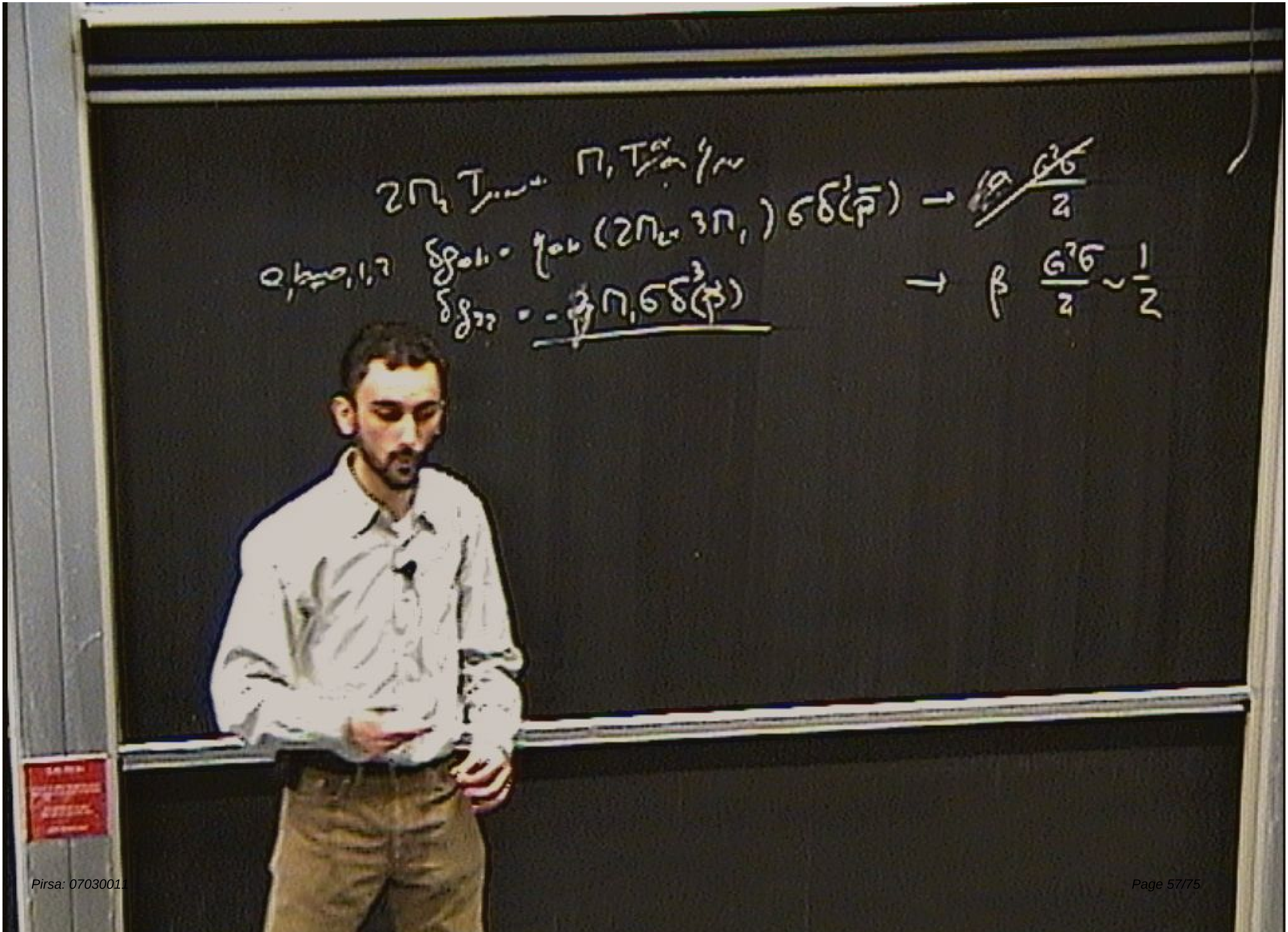
$N^2 \gg 1$

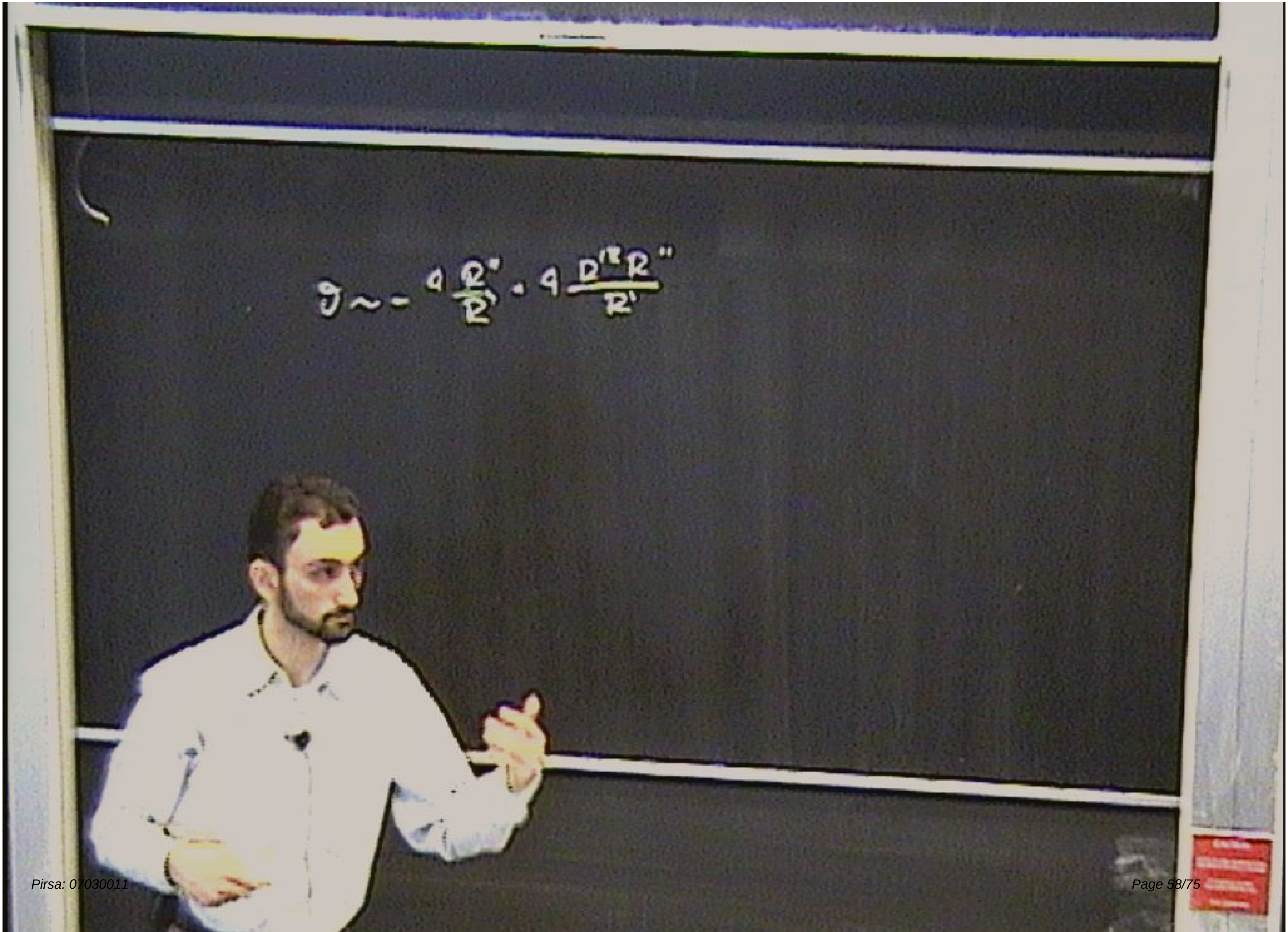
$$H\ell = \tan\frac{\sigma}{4M^3} \Rightarrow \frac{\sigma}{4M^3} = \arctan H\ell$$

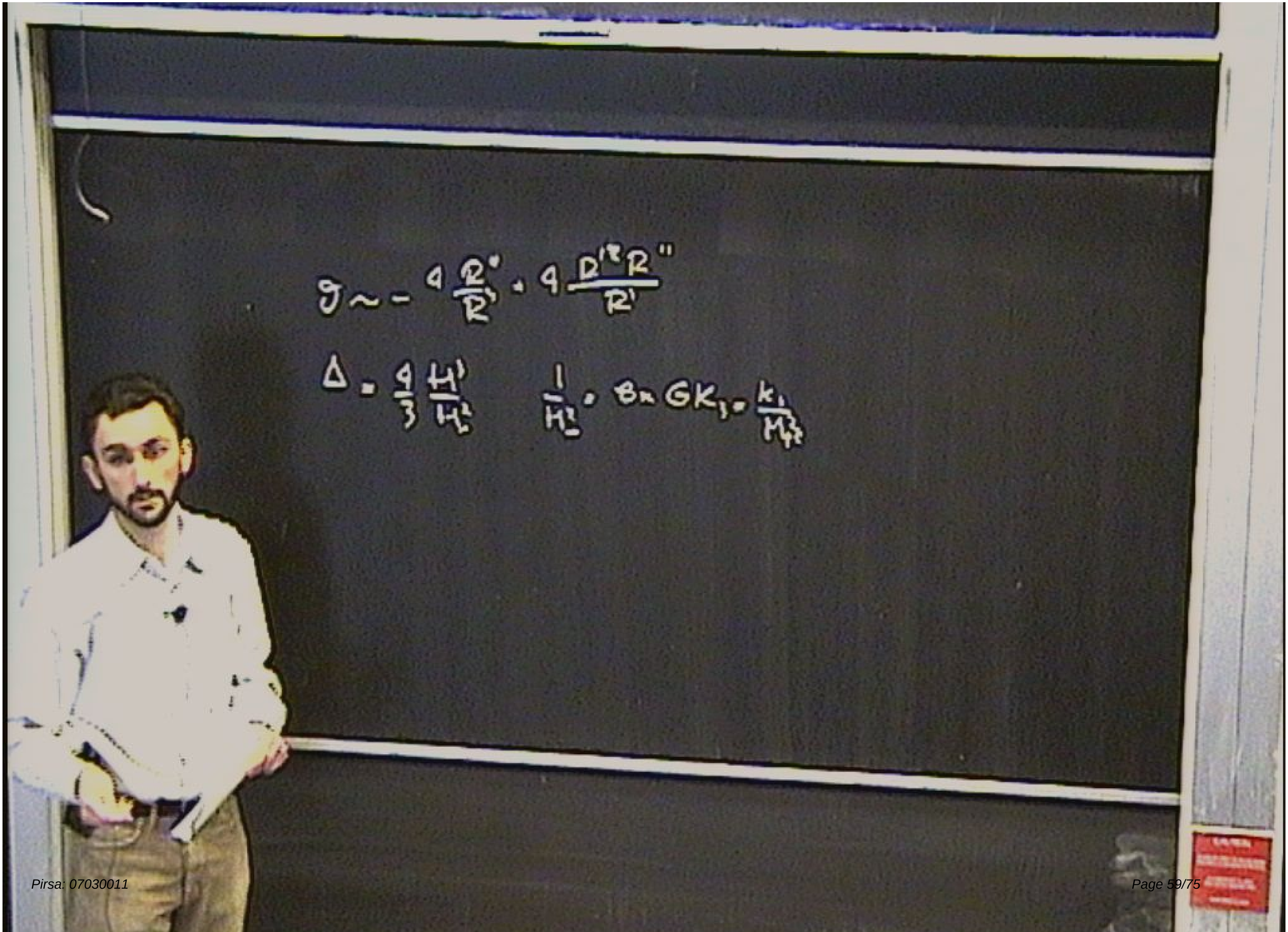
$$\sim H\ell\left(1 - \frac{1}{3}(H\ell)^2\right)$$

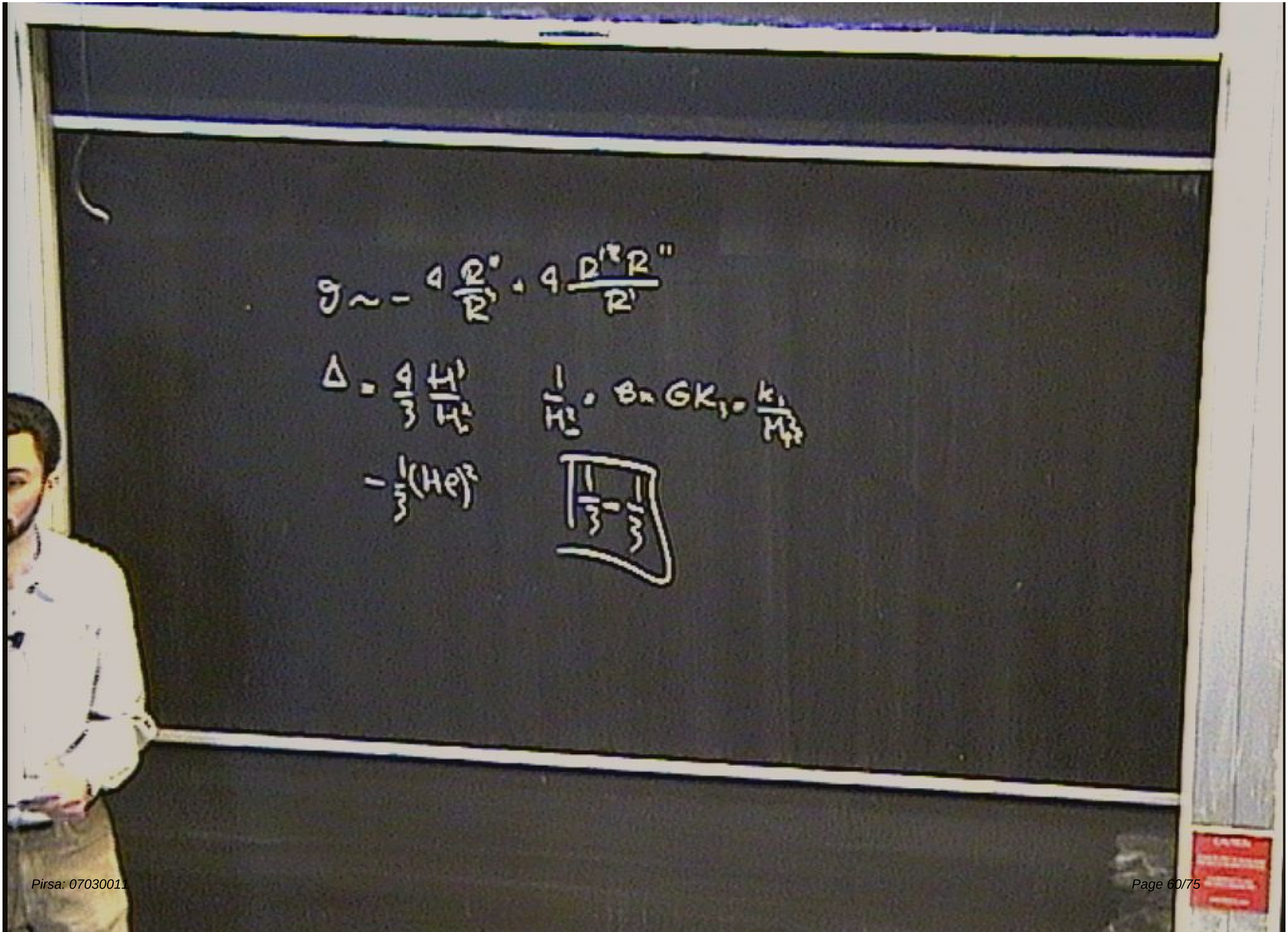
$\updownarrow$

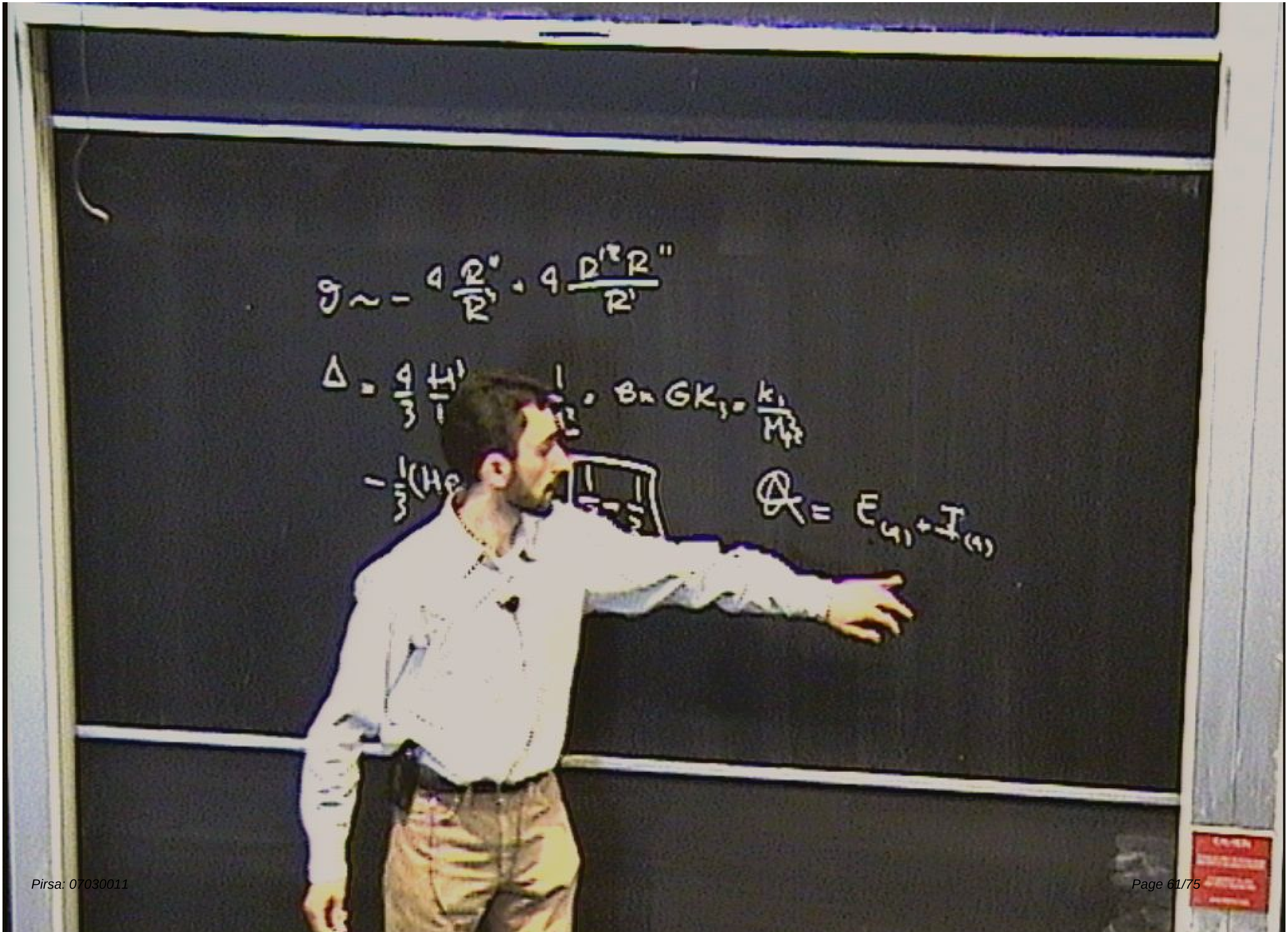
$\mathcal{O}$

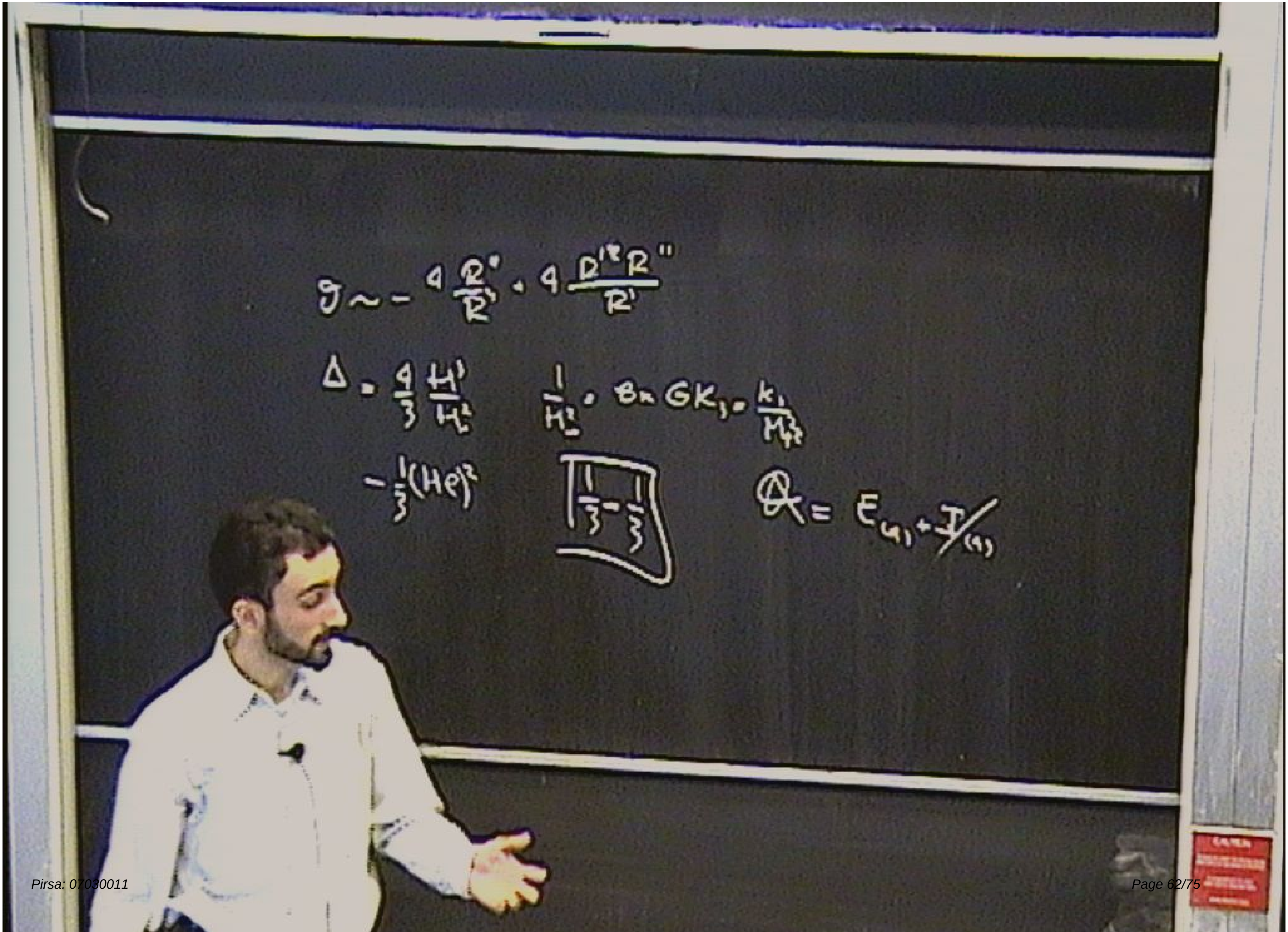


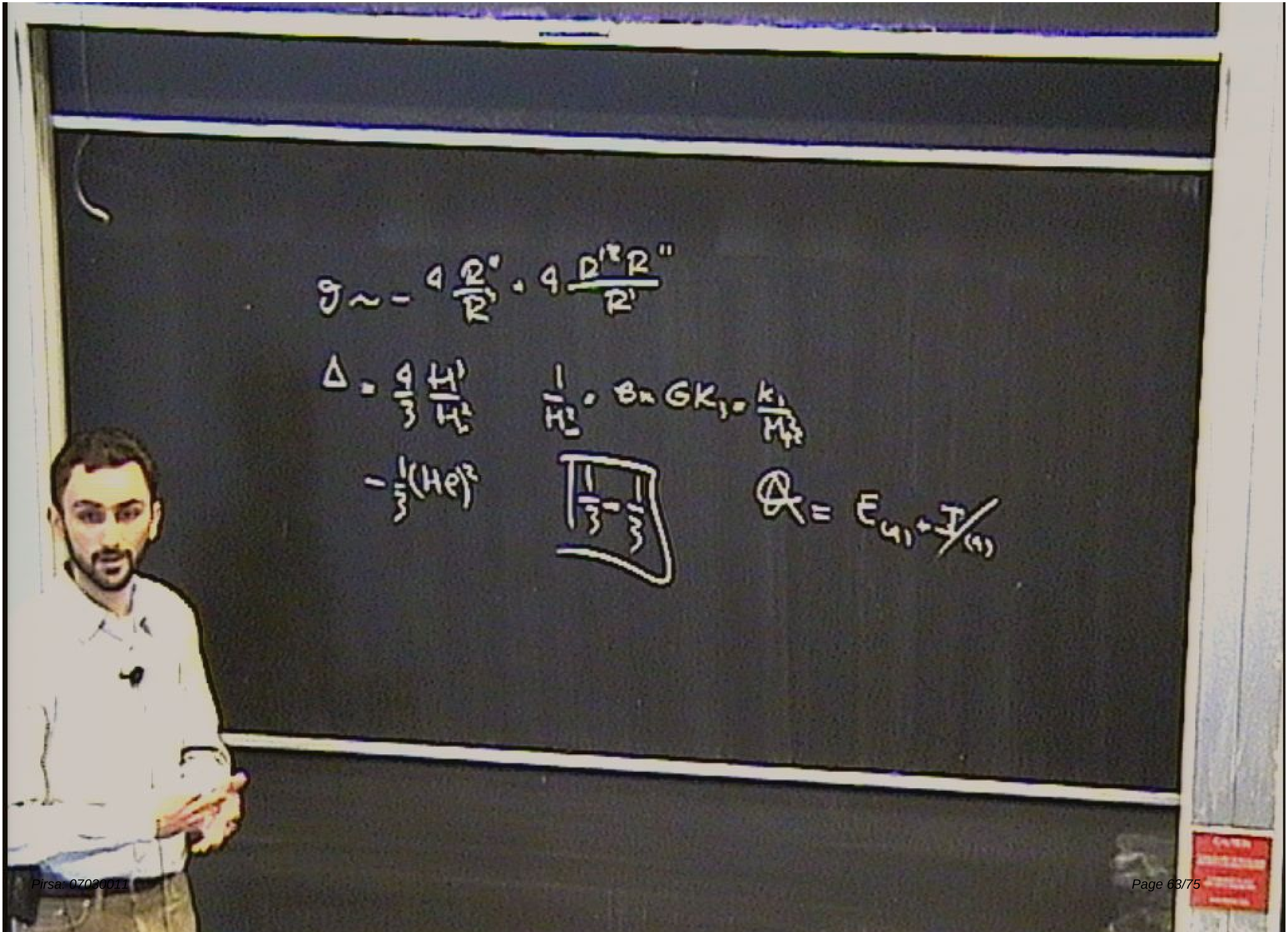



Δ = 4/3 H'/M_P²
1/M_P² = 8πGK_1 = k_1/M_P²






8π G K
E(4)



$$\mathcal{J} \sim -4\frac{R''}{R^3} + 4\frac{R'^2 R''}{R^3}$$

$$\Delta = \frac{4}{3}\frac{H^3}{M_p^2} \qquad \frac{1}{M_p^2} = 8\pi G K_3 = \frac{k_1}{M_p^2}$$

$$-\frac{1}{3}(H\rho)^2 \qquad \boxed{\frac{1}{3}-\frac{1}{3}} \qquad Q = E_{(4)} + \Pi_{(4)}$$

$$\text{RS II} \longleftrightarrow \text{CFT} \;\; w/\; \Lambda \;\; \text{coupled gravity}$$

$$N^2 \gg 1$$

$$H\ell = \tan \frac{\sigma}{4M^3} \Rightarrow \frac{\sigma}{4M^3} = \arctan H\ell$$

$$\sim H\ell\left(1 - \frac{1}{3}(H\ell)^2\right)$$

$$\updownarrow$$

$$\vartheta$$

$$H\ell \ll 1$$

$$\text{RS II} \longleftrightarrow \text{CFT w/ } \Lambda \text{ coupled gravity}$$

$$N^2 \gg 1$$

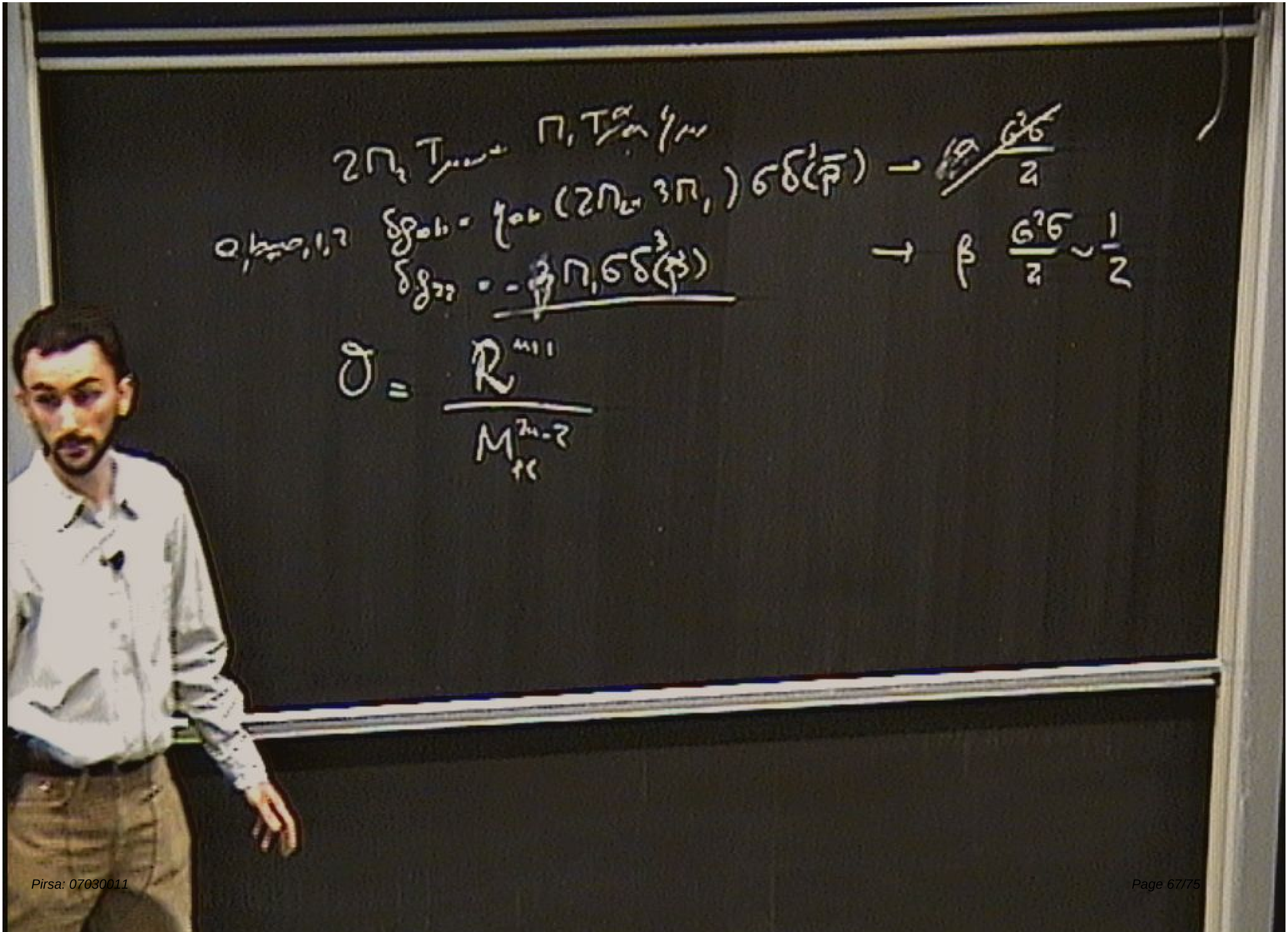
$$H\ell = \tan\frac{\sigma}{4M^3} \rightarrow \frac{\sigma}{4M^3} = \arctan H\ell \sim H\ell\left(1 - \frac{1}{3}(H\ell)^2\right)$$

$$H\ell \ll 1$$

$$\frac{\sigma}{4M^3} = H\left(1 + (H\ell)^2 + (H\ell)^4 + \ldots\right.$$

$\updownarrow$

0

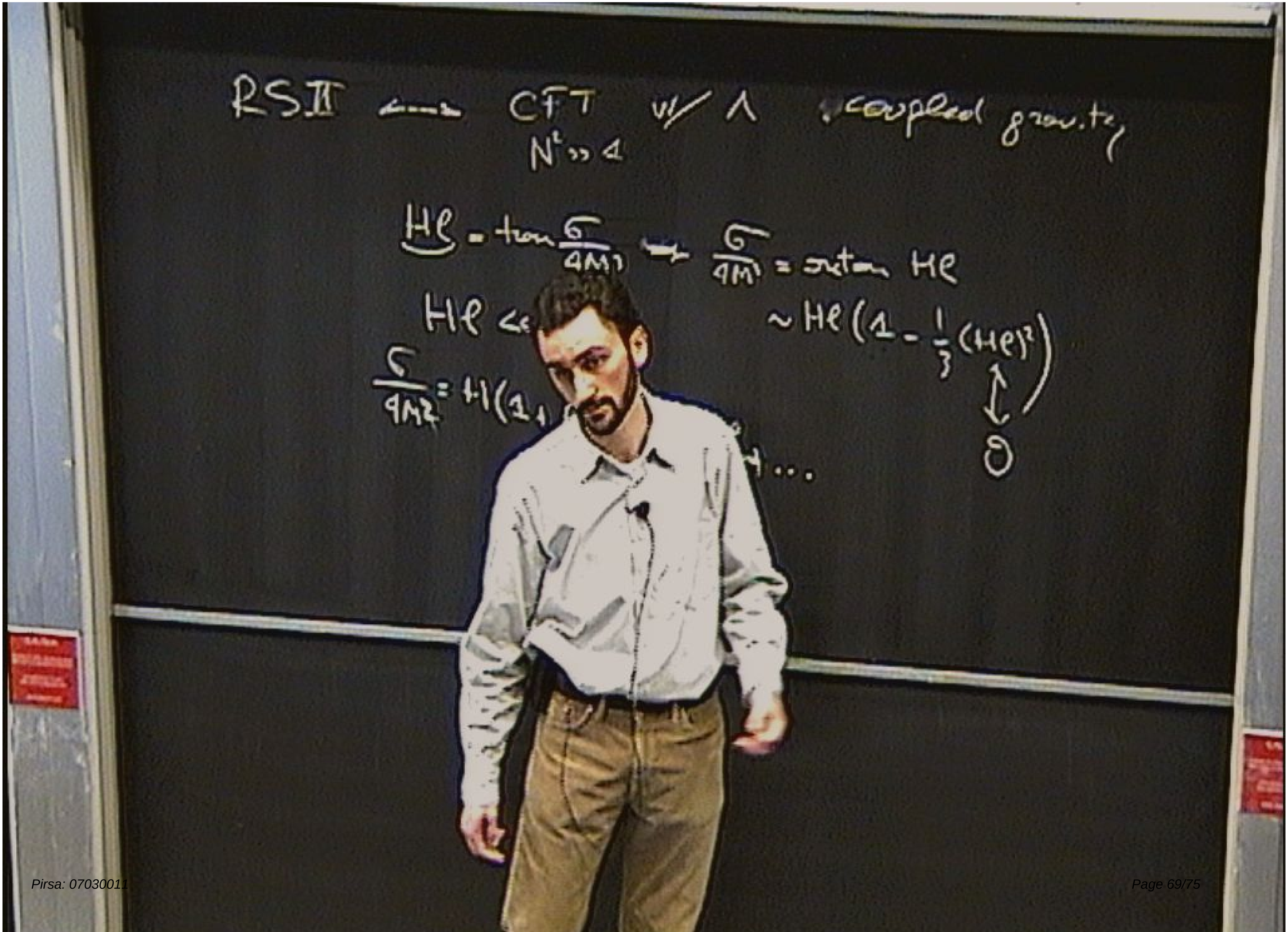


$$2\Pi_2 T_{\mu\nu} \quad \Pi_1 T^{\alpha}_{\alpha}\eta_{\mu\nu}$$

$$a,b=0,1,2 \quad \delta g_{ab} = \eta_{ab}(2\Pi_2, 3\Pi_1)\,\sigma\delta(\vec{p}) \rightarrow \frac{G\sigma}{z}$$

$$\delta g_{zz} = -\beta\,\Pi_1\,\sigma\delta^3(p) \rightarrow \beta\,\frac{G^2\sigma}{z} \sim \frac{1}{z}$$

$$\mathcal{O} = \frac{R^{n+1}}{M_{tc}^{2n-2}} \sim (He)^{n+1}$$


RS II ⟷ CFT w/ Λ coupled gravity
N² >> 1
Hℓ = tan σ/4M² → σ/4M² = arctan Hℓ
~ Hℓ (1 - 1/3 (Hℓ)²)

RS II $\longleftrightarrow$ CFT w/ Λ + coupled gravity

$N^2 \gg 1$

$$H\ell = \tan\frac{\sigma}{4M^3} \Rightarrow \frac{\sigma}{4M^3} = \arctan H\ell$$

$H\ell \ll 1$ $\qquad \sim H\ell\left(1 - \frac{1}{3}(H\ell)^2\right)$

$$\frac{\sigma}{4M^3} = H\ell\left(1 + (H\ell)^2 + (H\ell)^4 + \dots\right.$$

$\updownarrow$

0

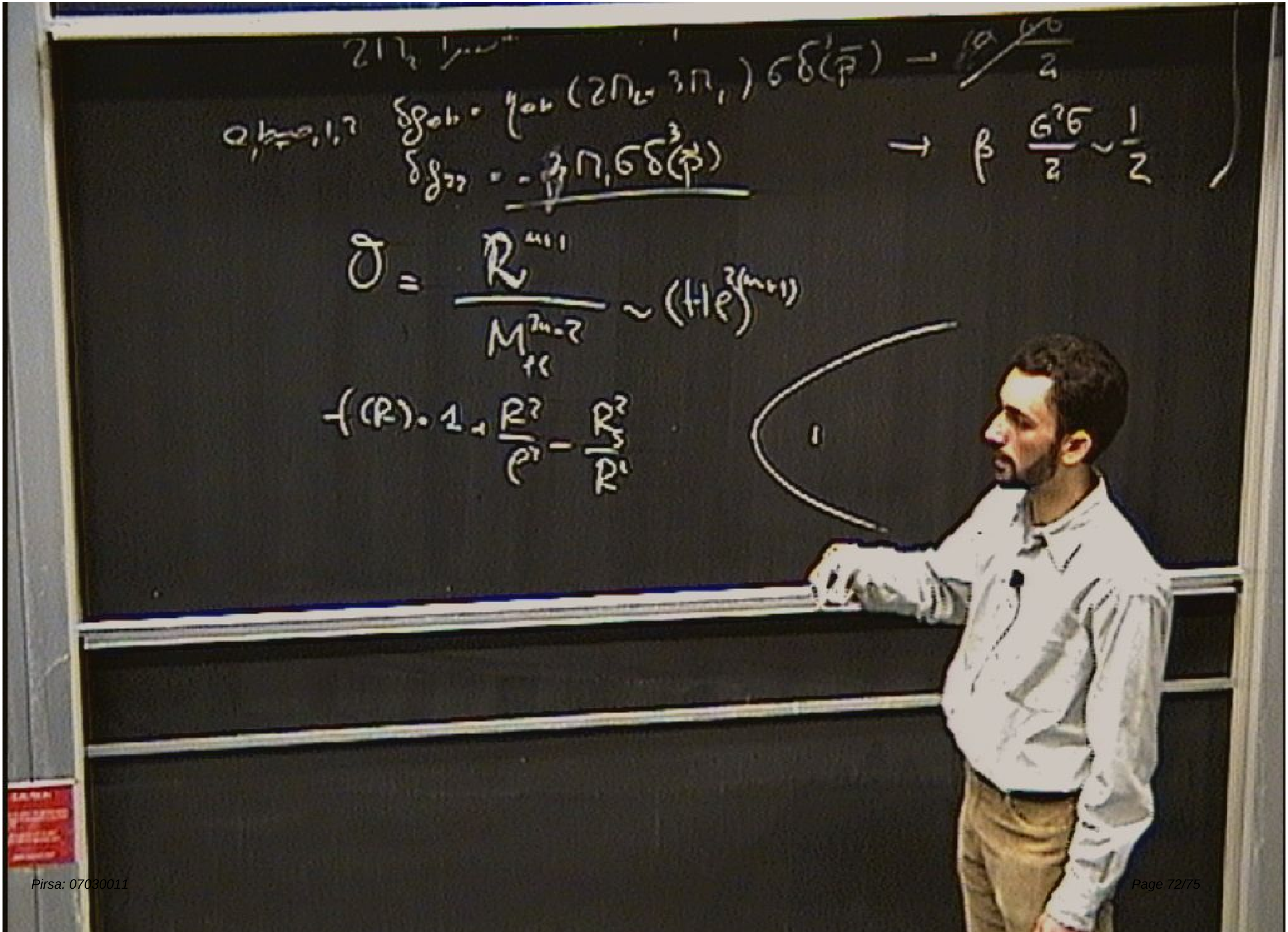
$$2\Pi_2 \ldots \qquad \sigma\delta(\vec{p}) \rightarrow \frac{\ldots}{2}$$

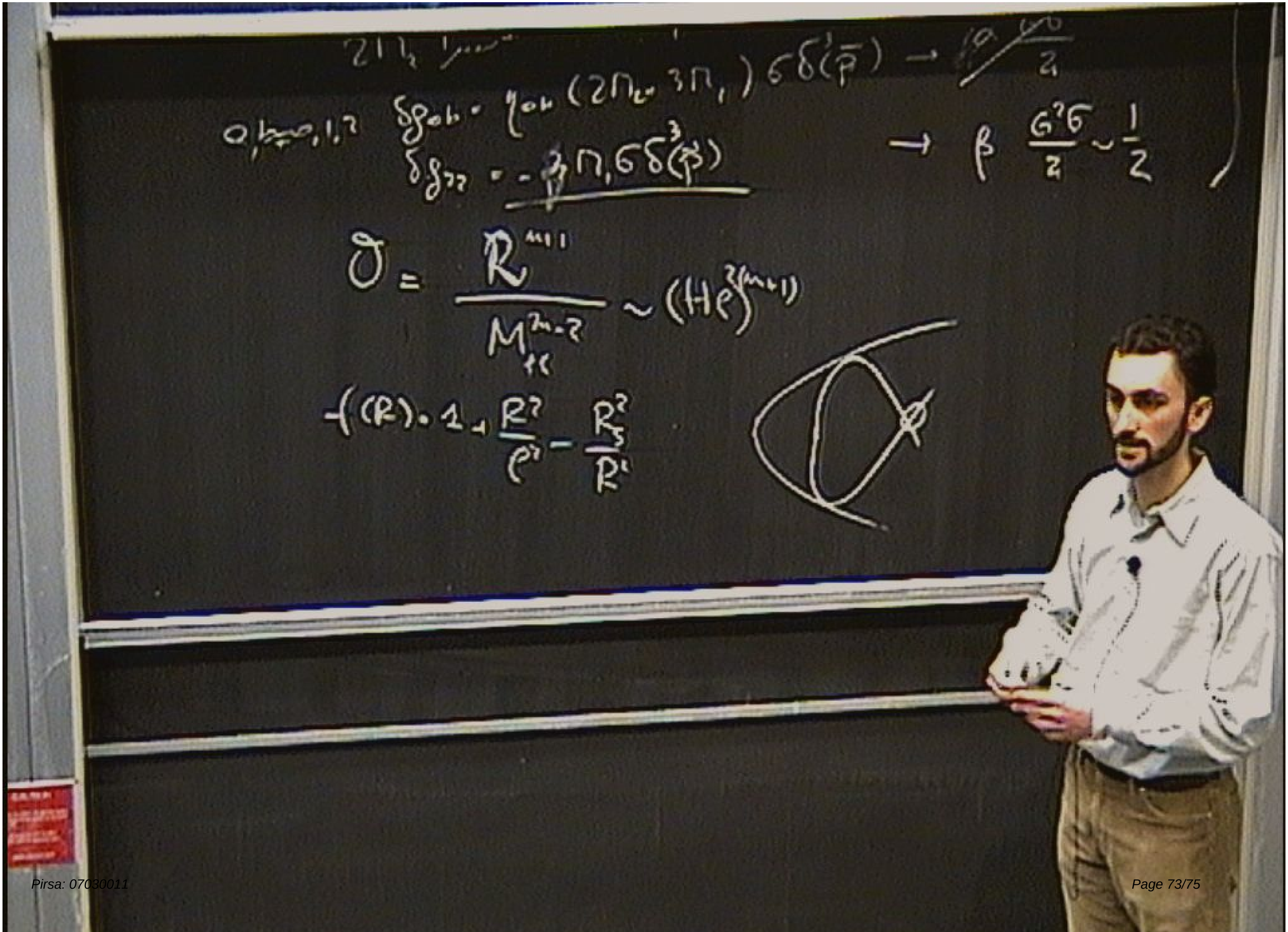
$$a,b=0,1,2 \quad \delta g_{ab} = \eta_{ab}(2\Pi_2 - 3\Pi_1)\,\sigma\delta(\vec{p}) \quad \rightarrow \beta\,\frac{G^2\sigma}{2} \sim \frac{1}{2}$$

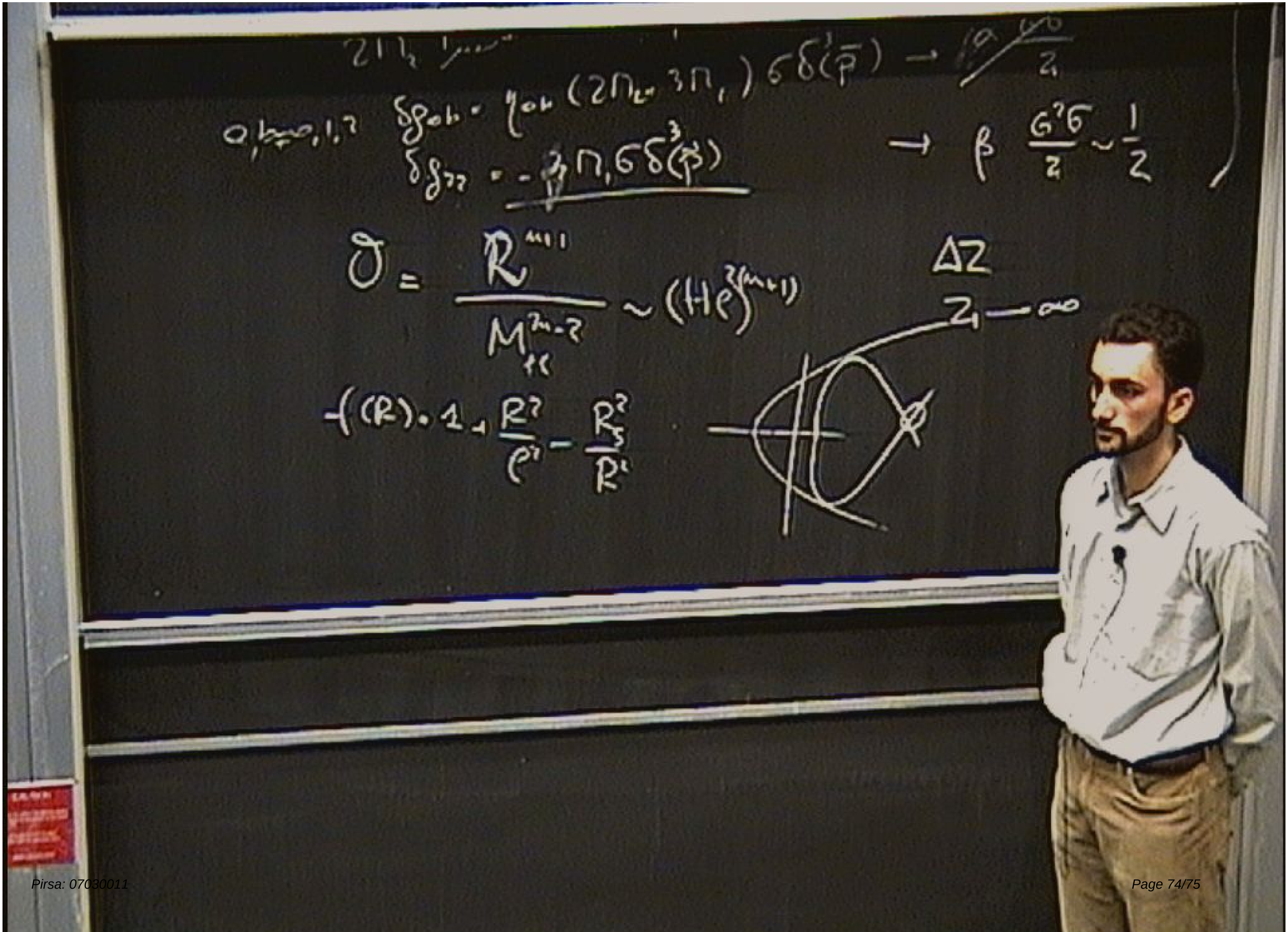
$$\delta g_{33} = -3\Pi_1\sigma\delta^3(\vec{p})$$

$$\mathcal{O} = \frac{R^{n+1}}{M_{pl}^{2n-2}} \sim (H\rho)^{2(n+1)}$$

$$f(R) = 1 + \frac{R^2}{\rho^2} - \frac{R_s^2}{R^2}$$






ΔZ
Z₁ — ∞