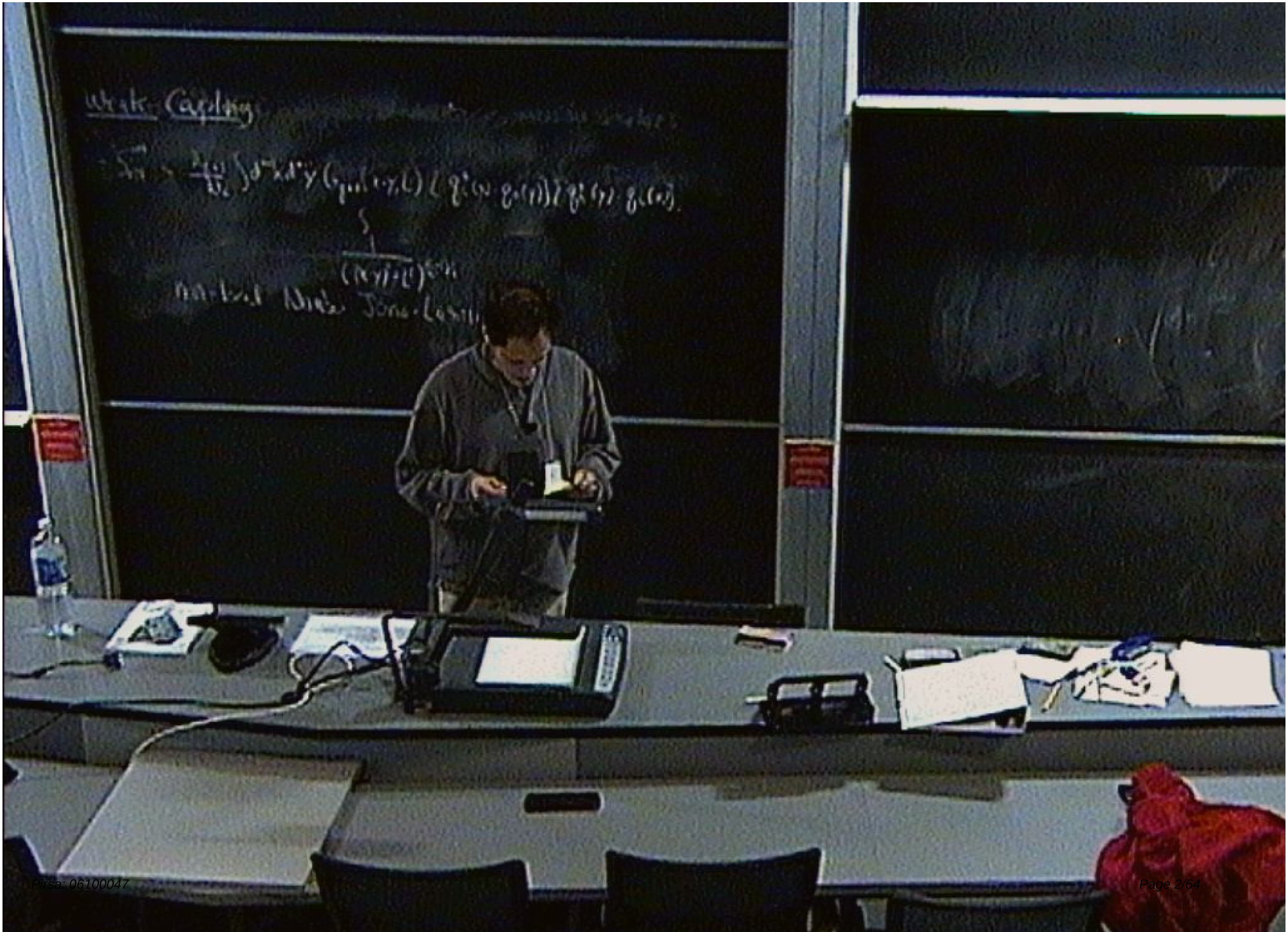
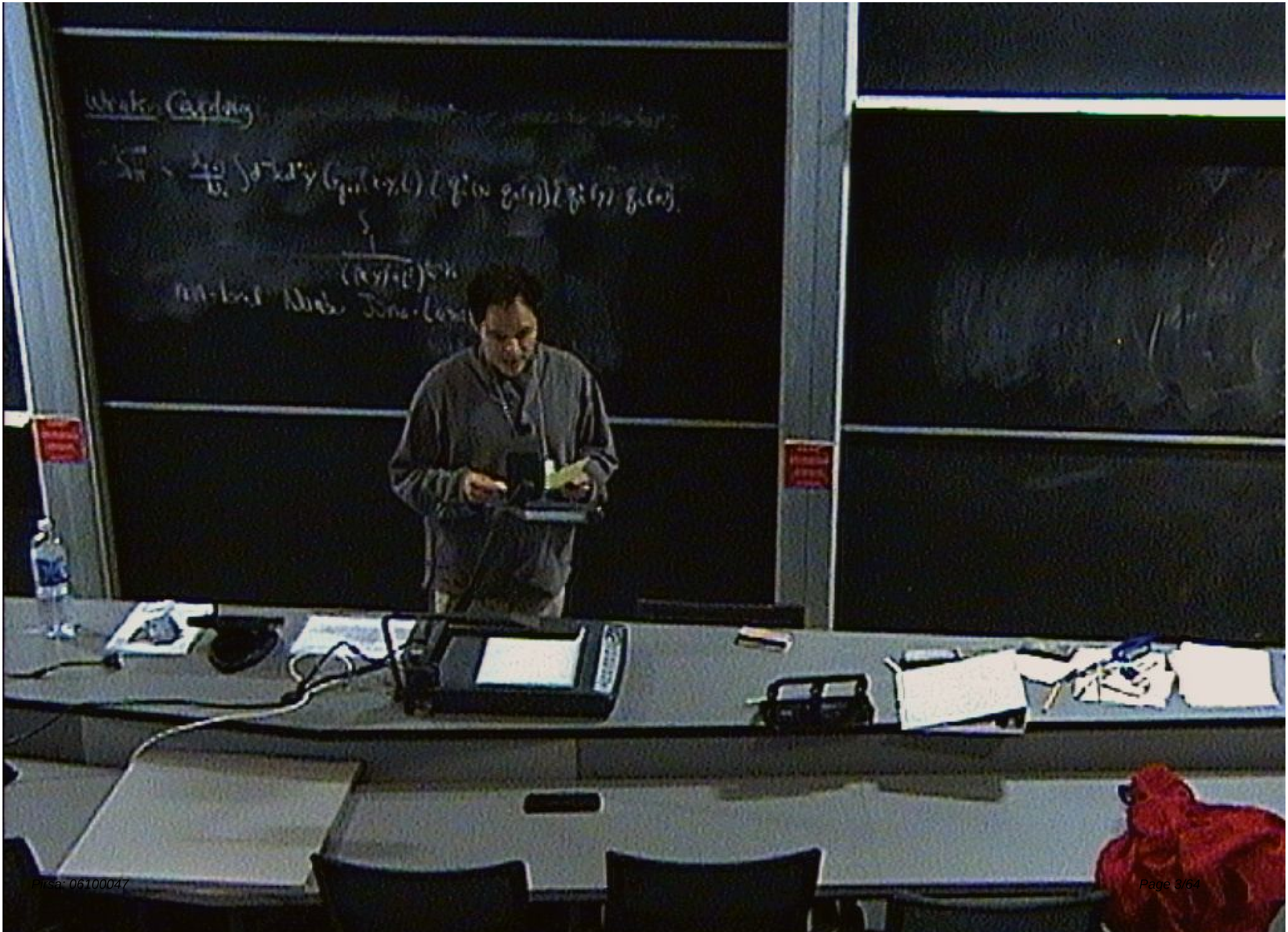
Title: Exact Classical Solutions in String Cosmology

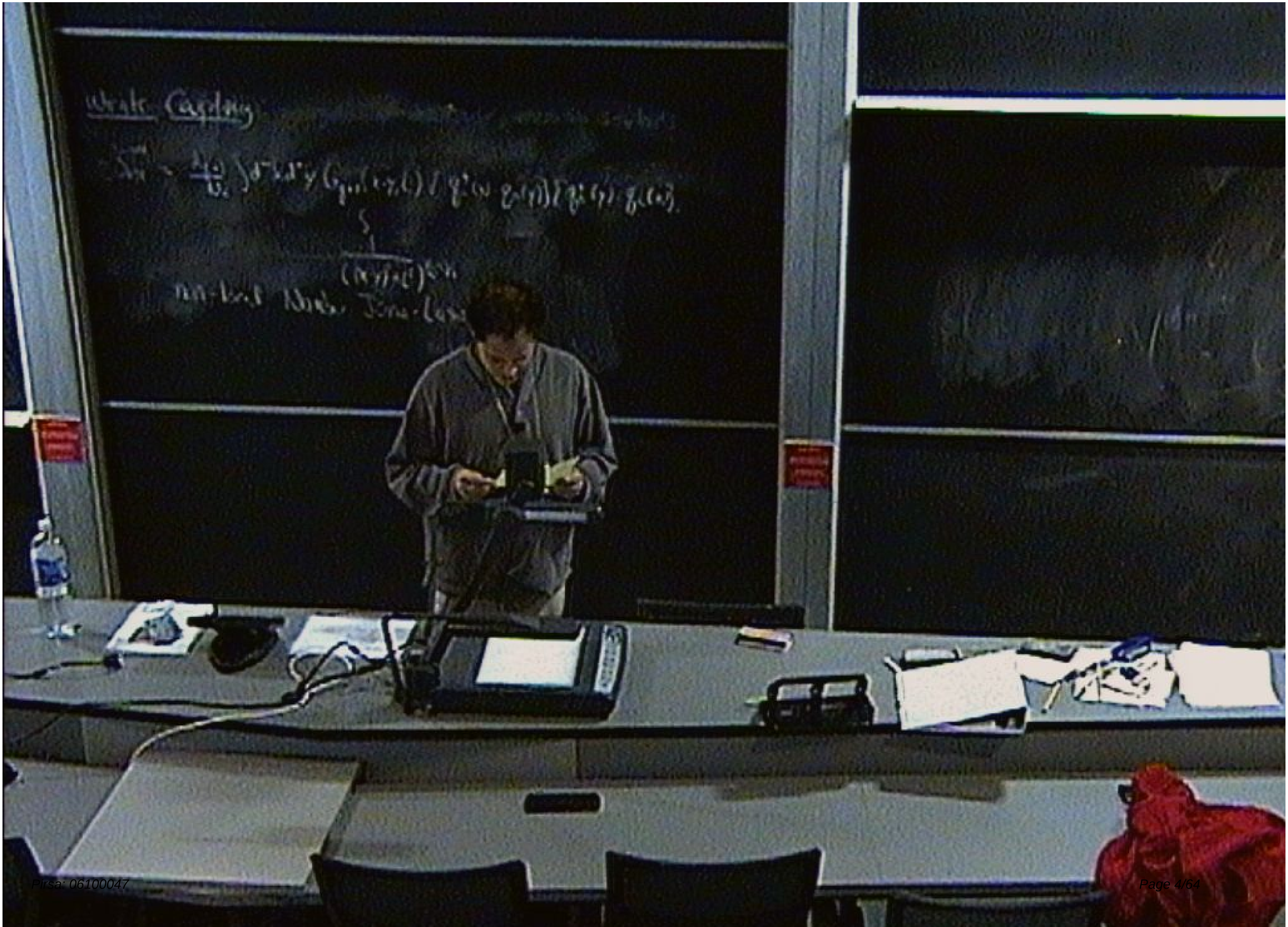
Date: Oct 14, 2006 11:45 AM

URL: http://pirsa.org/06100047

Abstract:




Weak Coupling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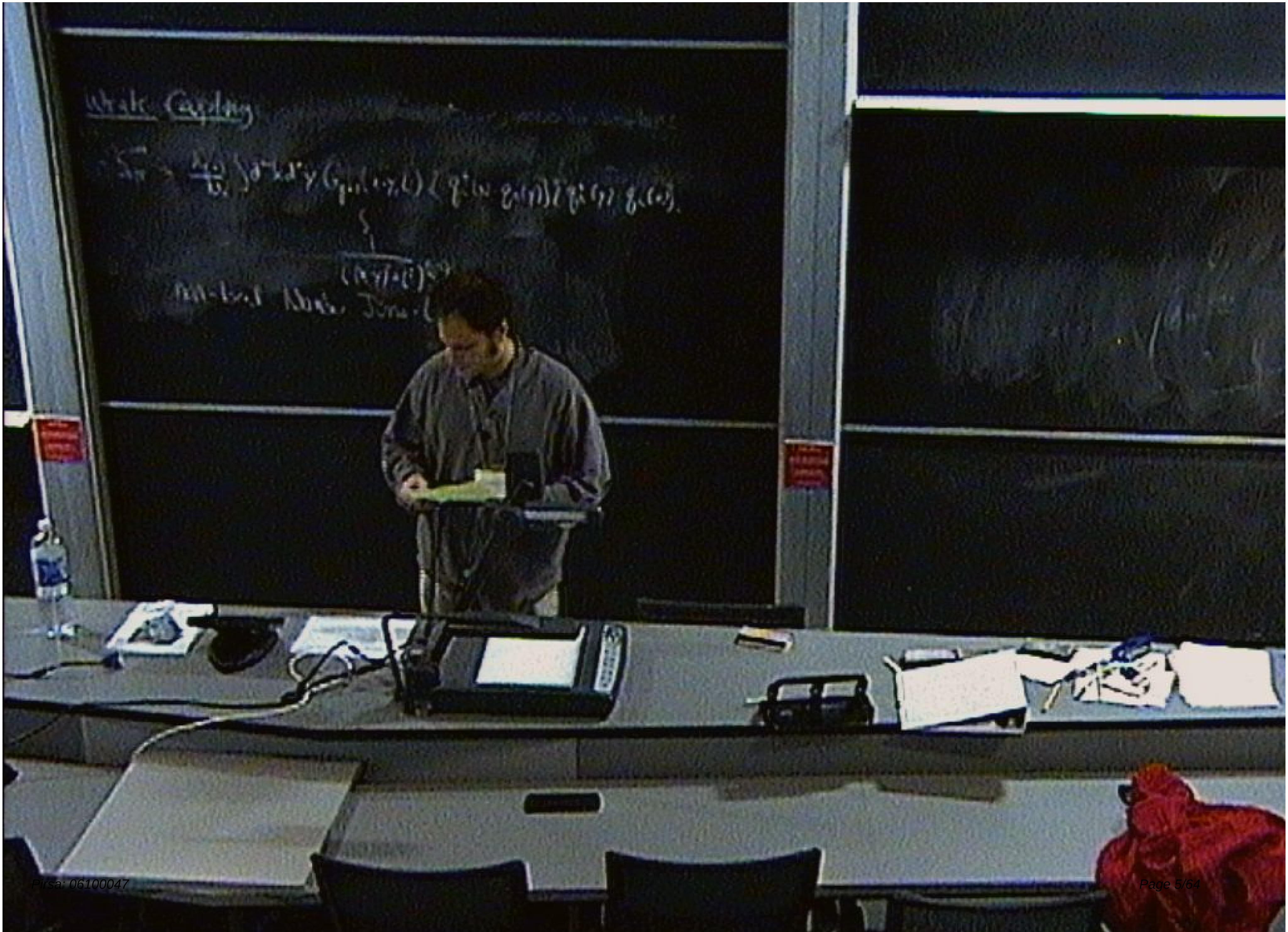
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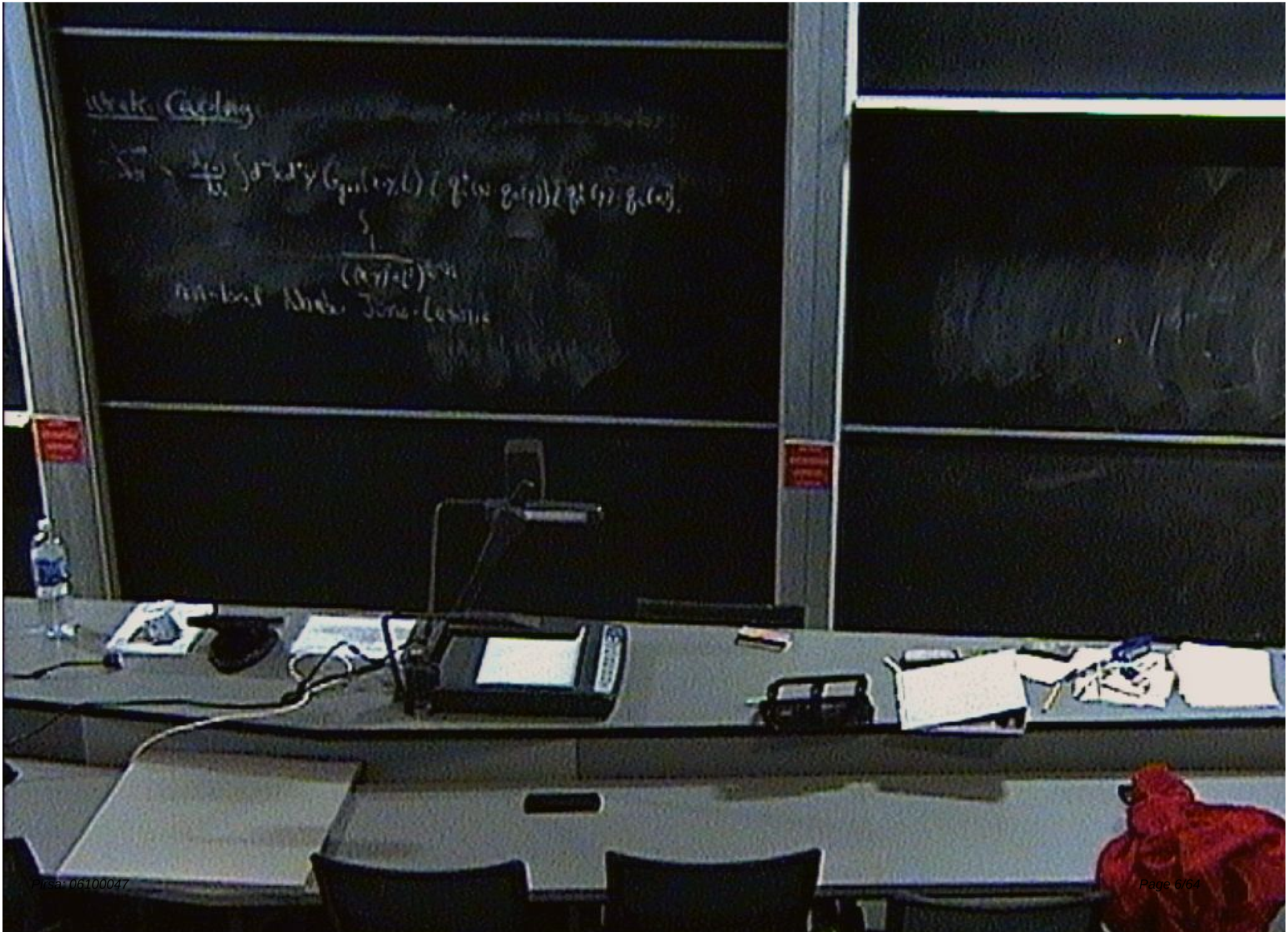
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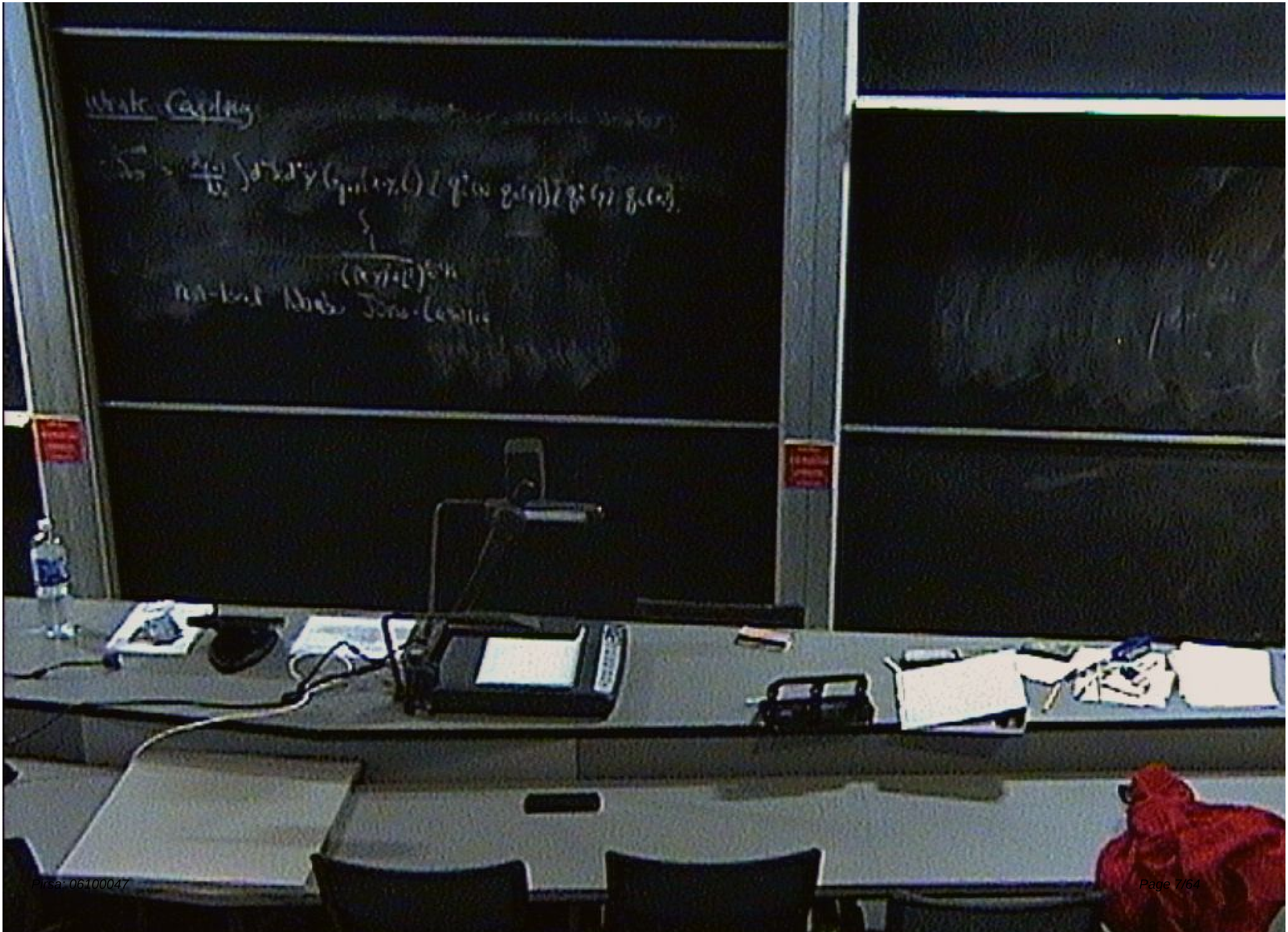

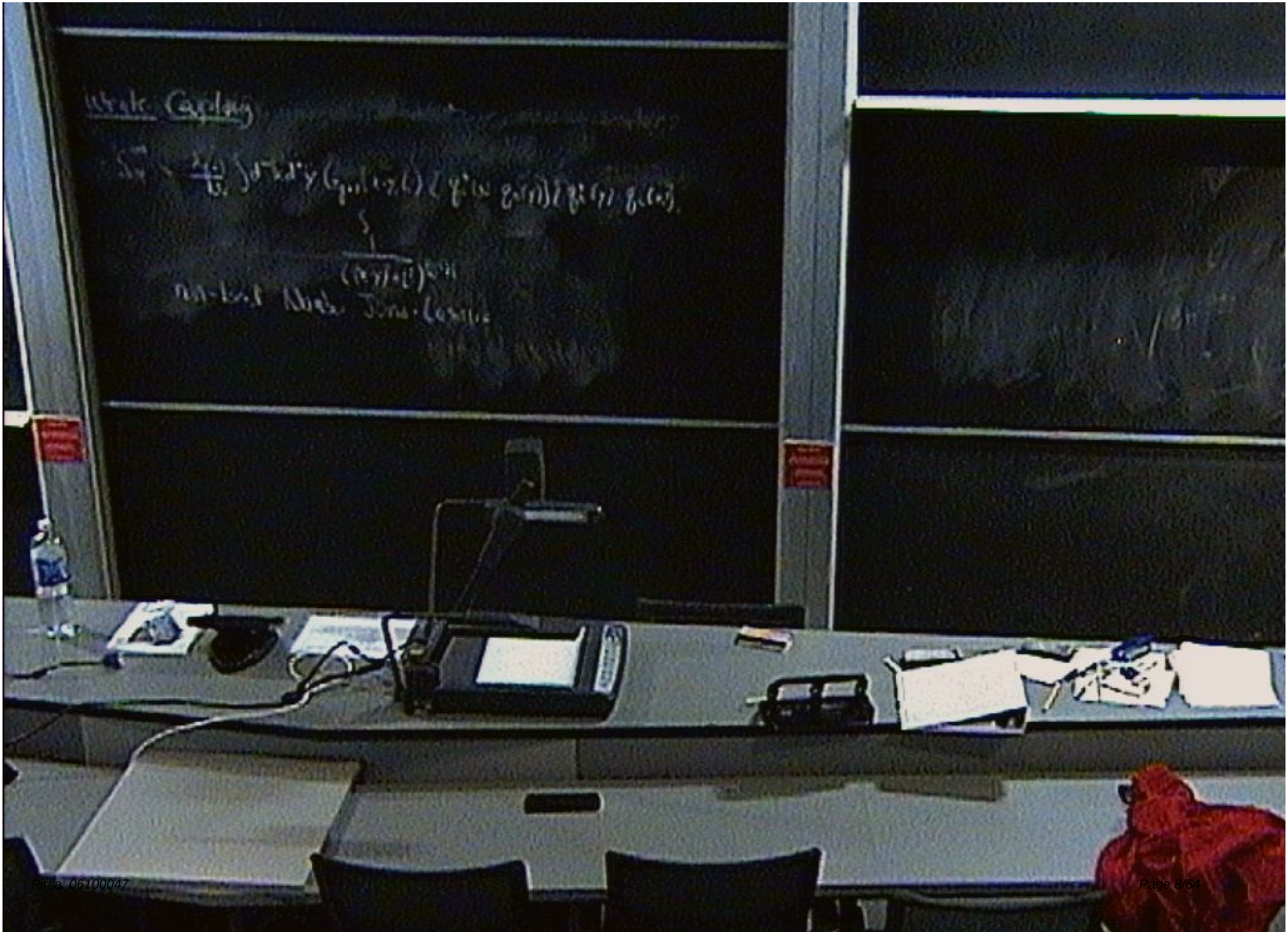
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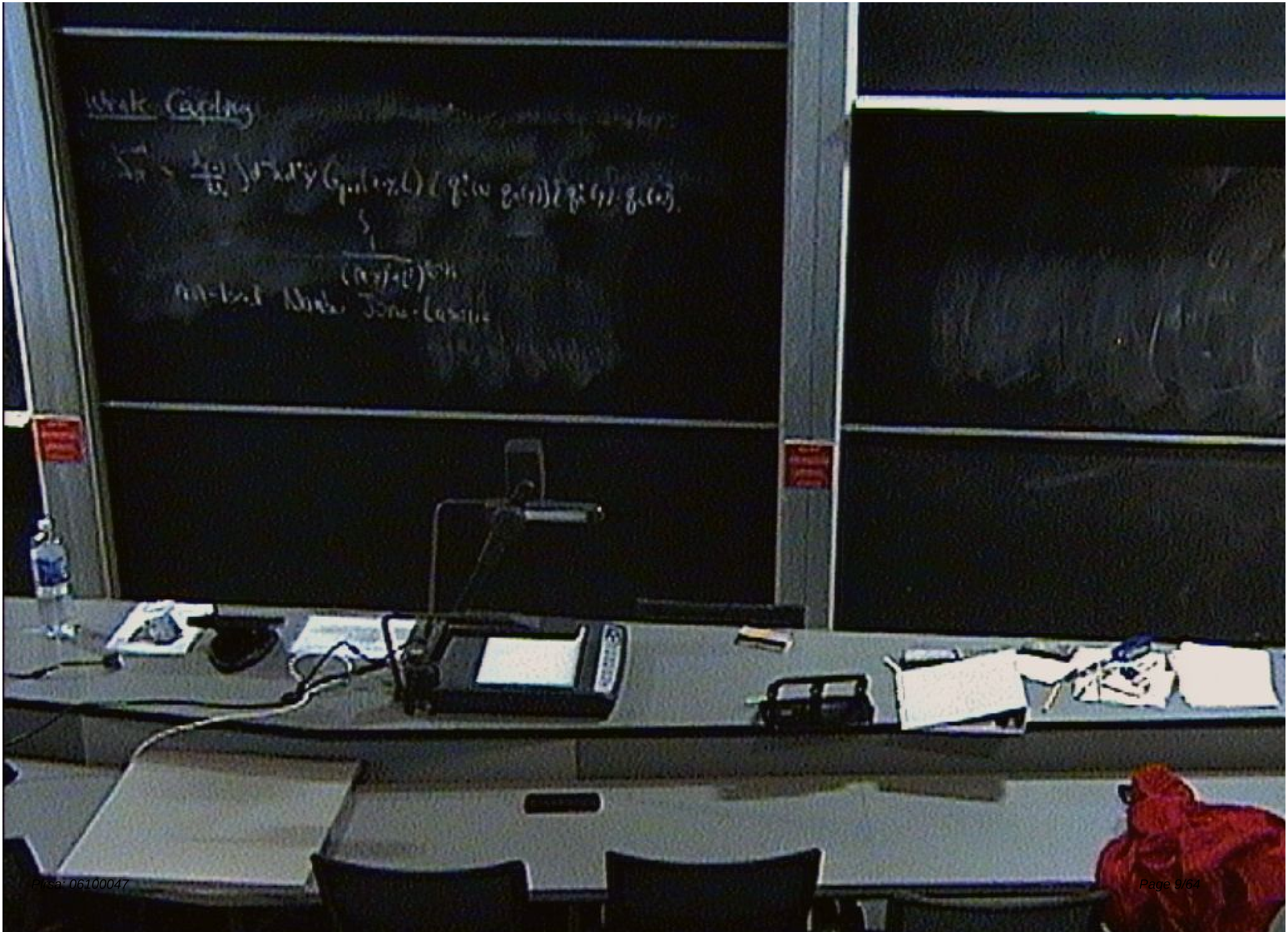
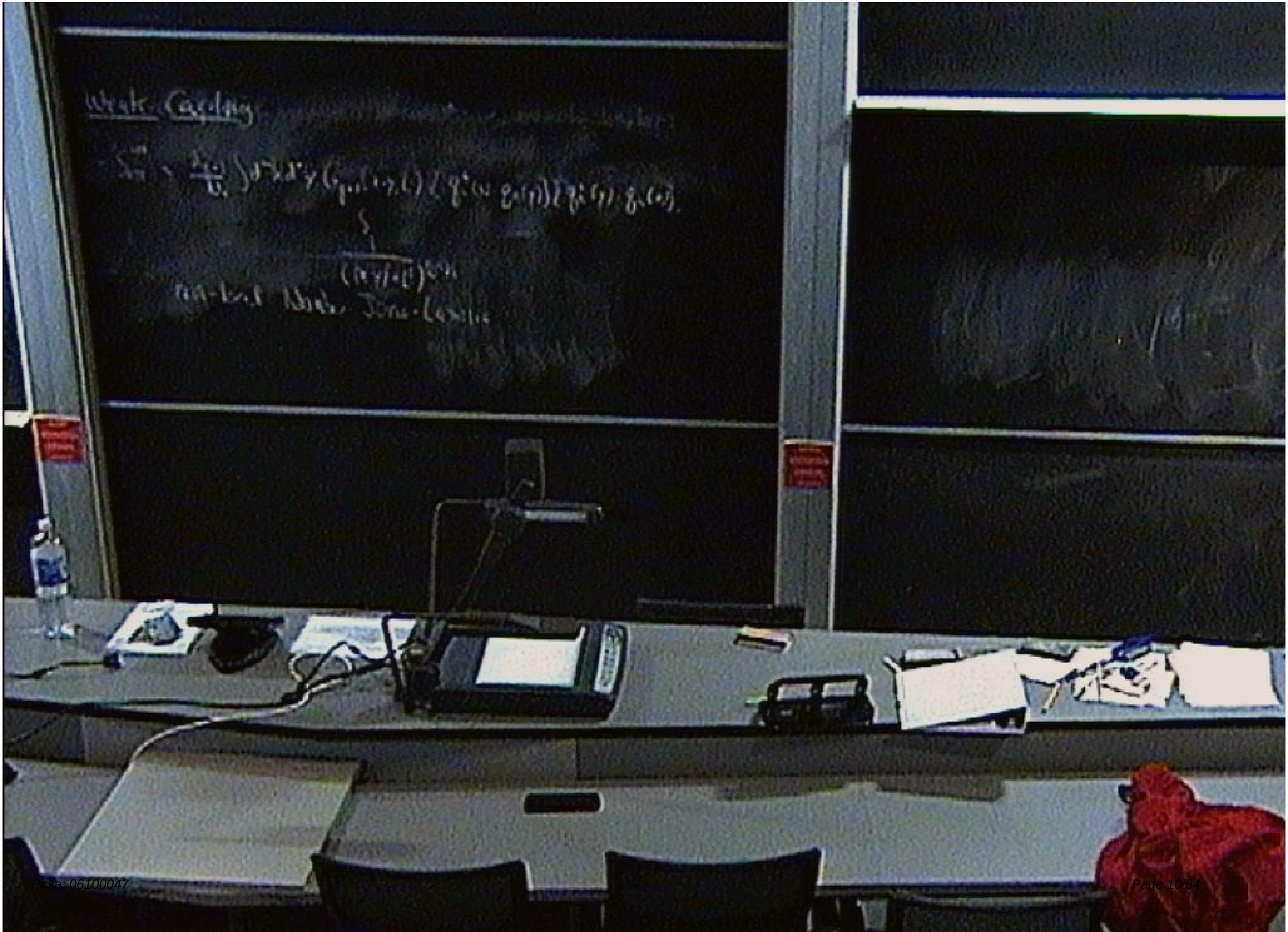
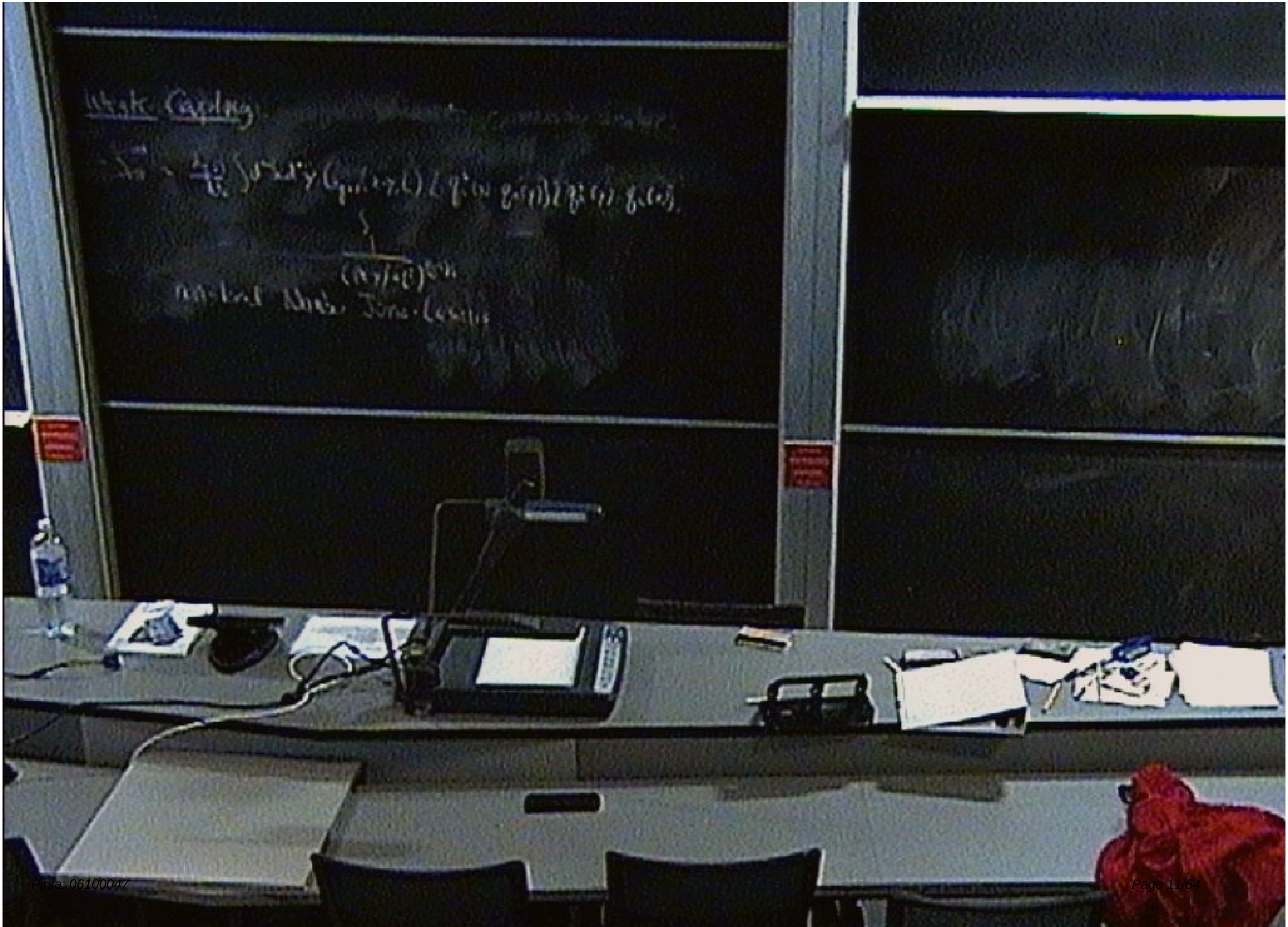
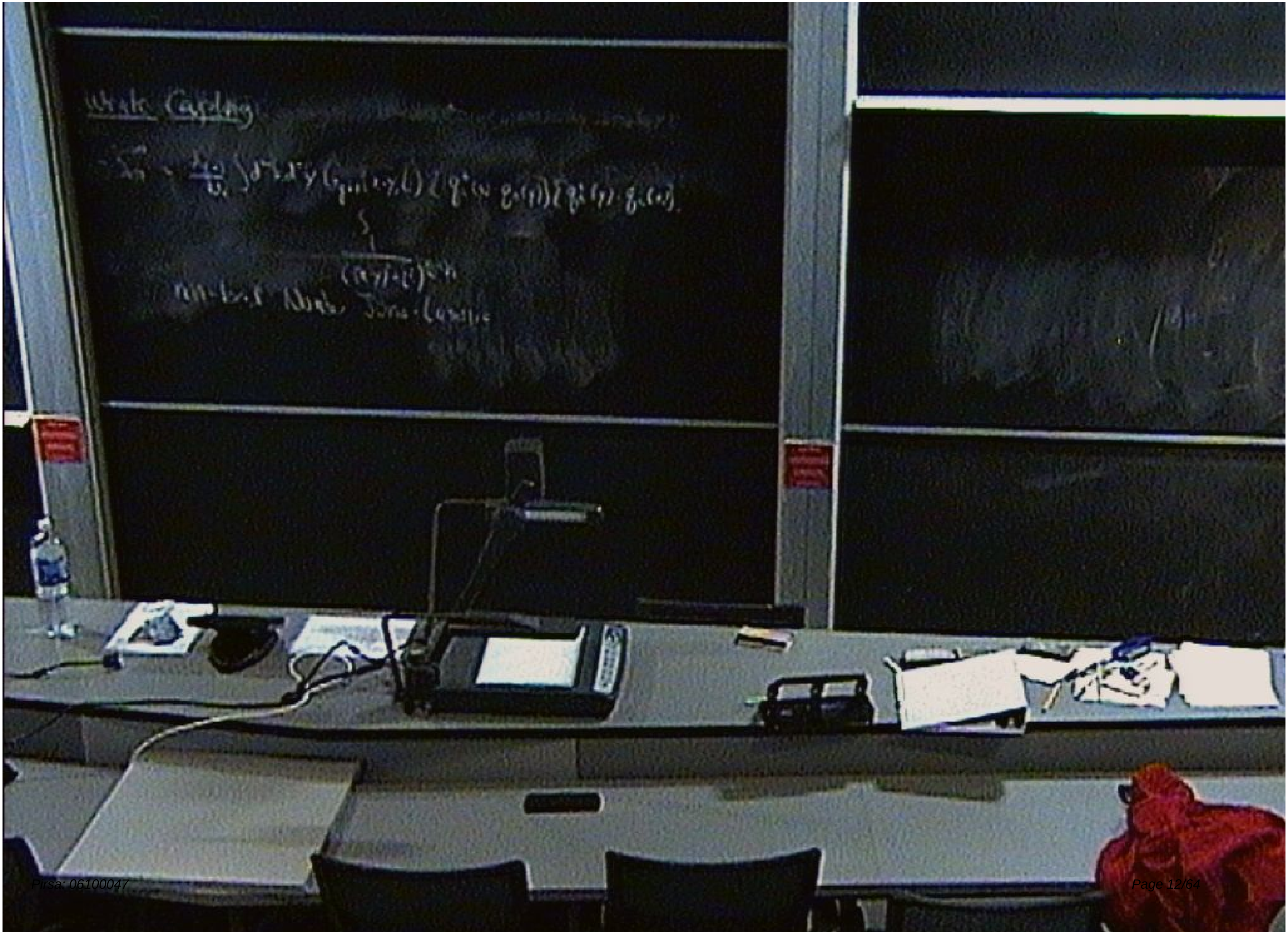
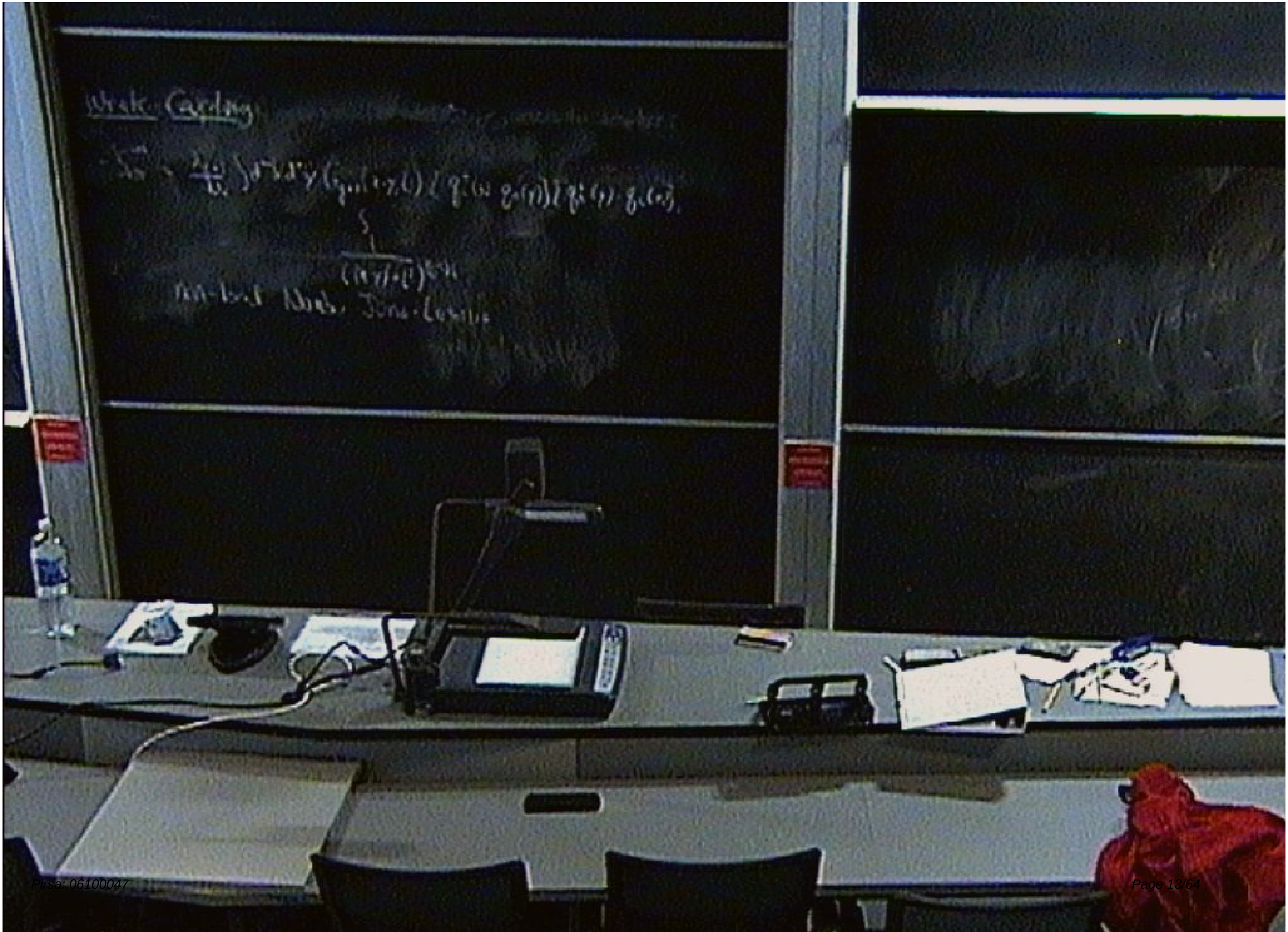
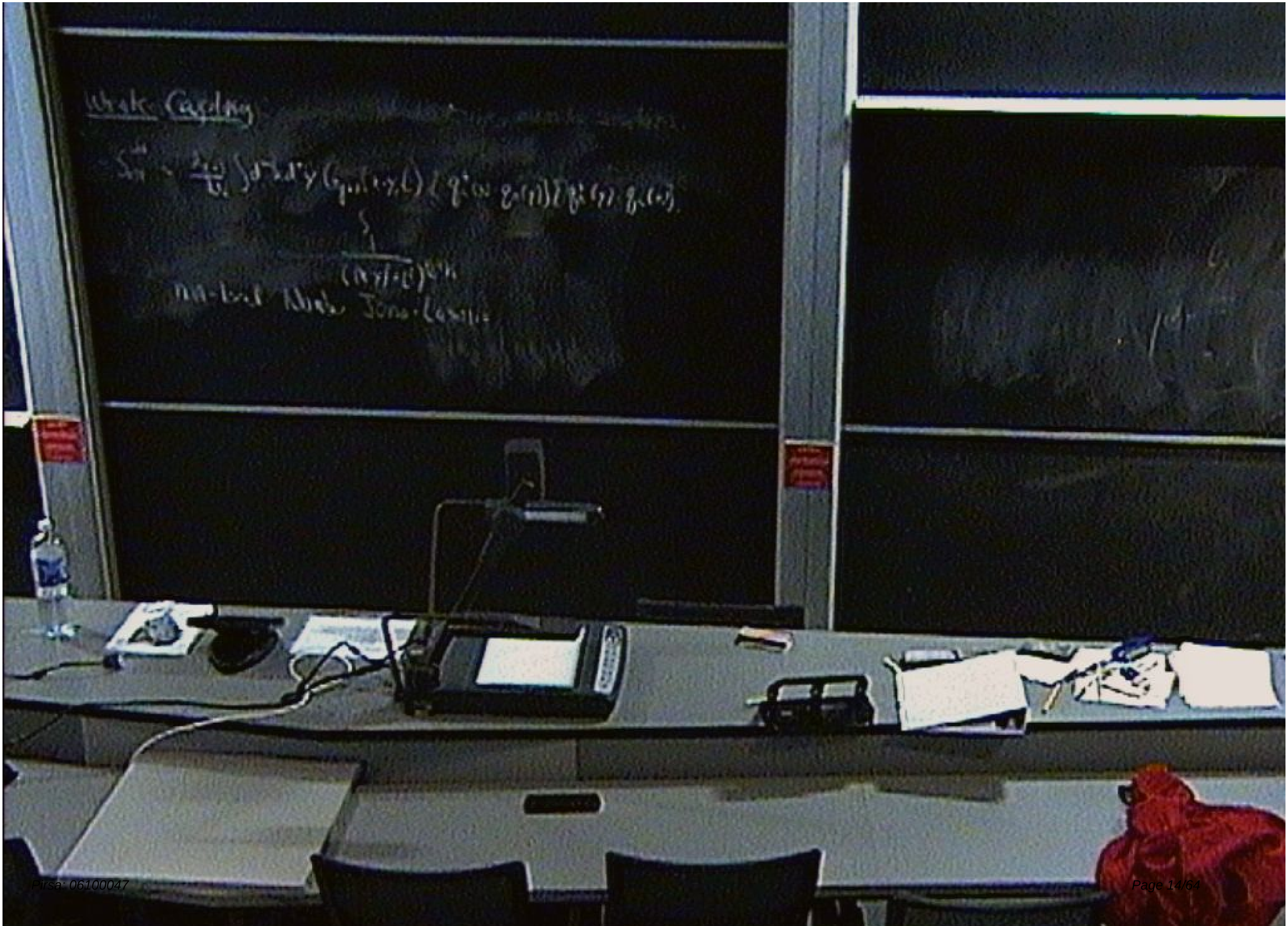

Weak Coupling

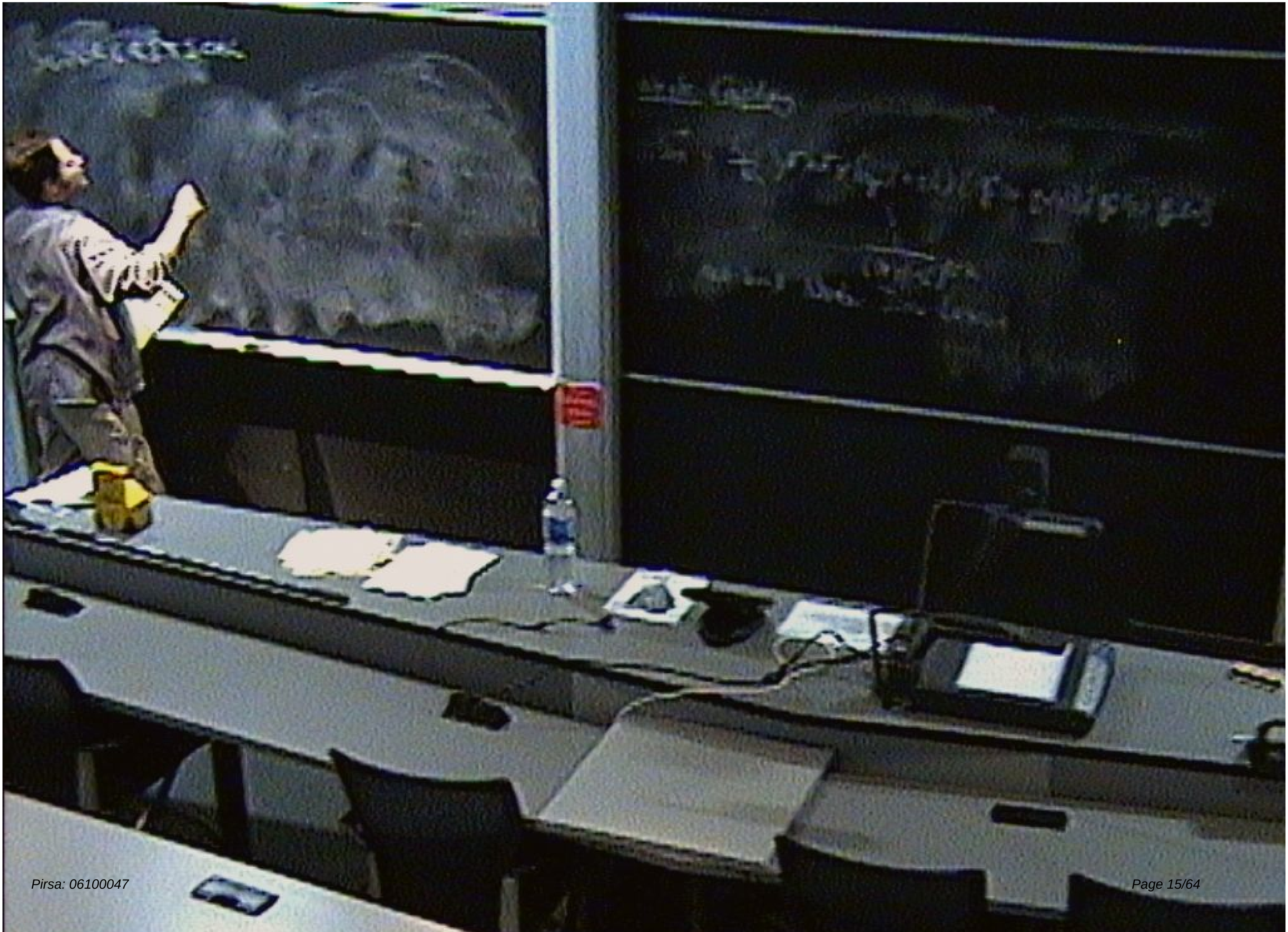


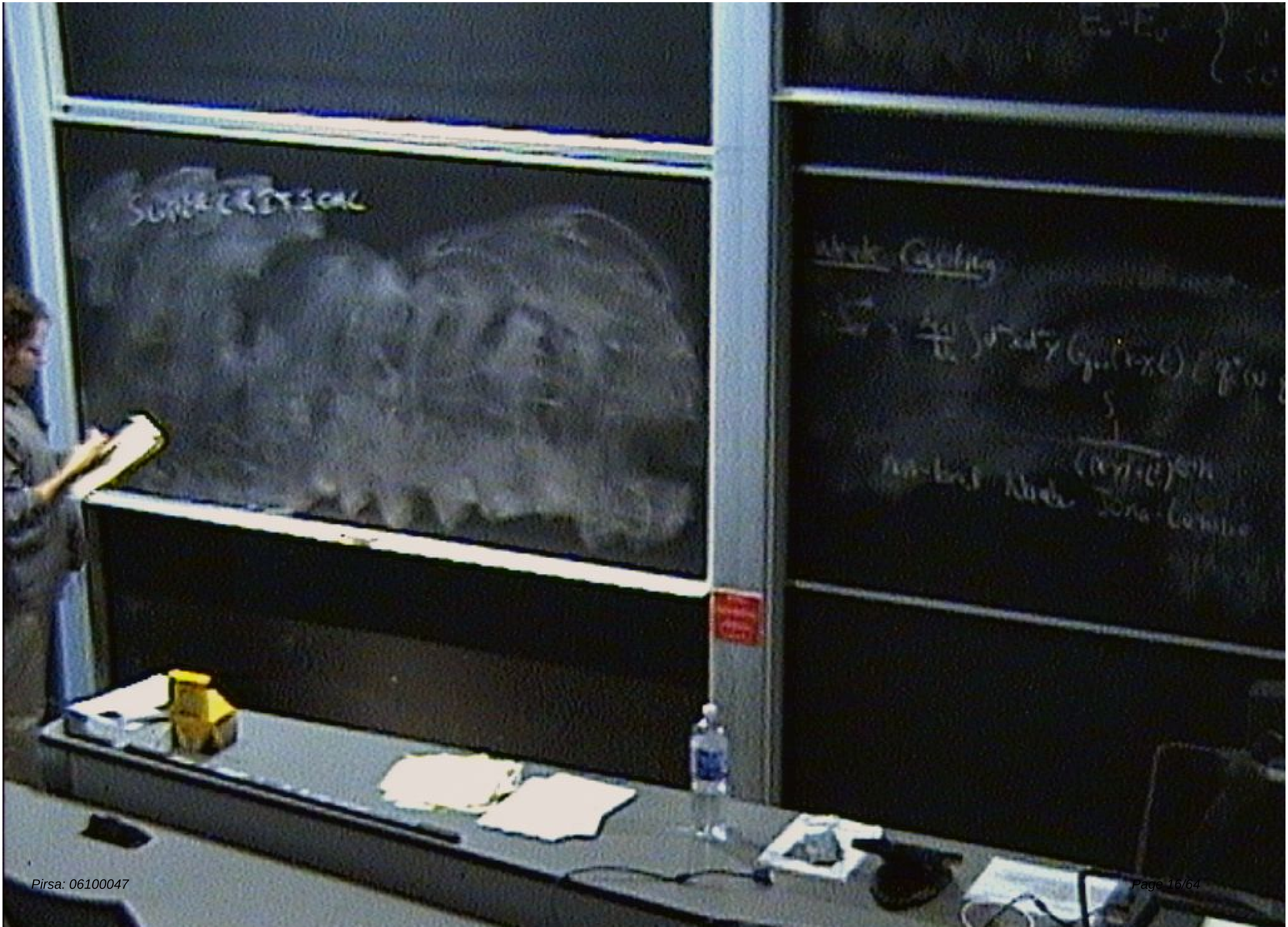

Weak Coupling

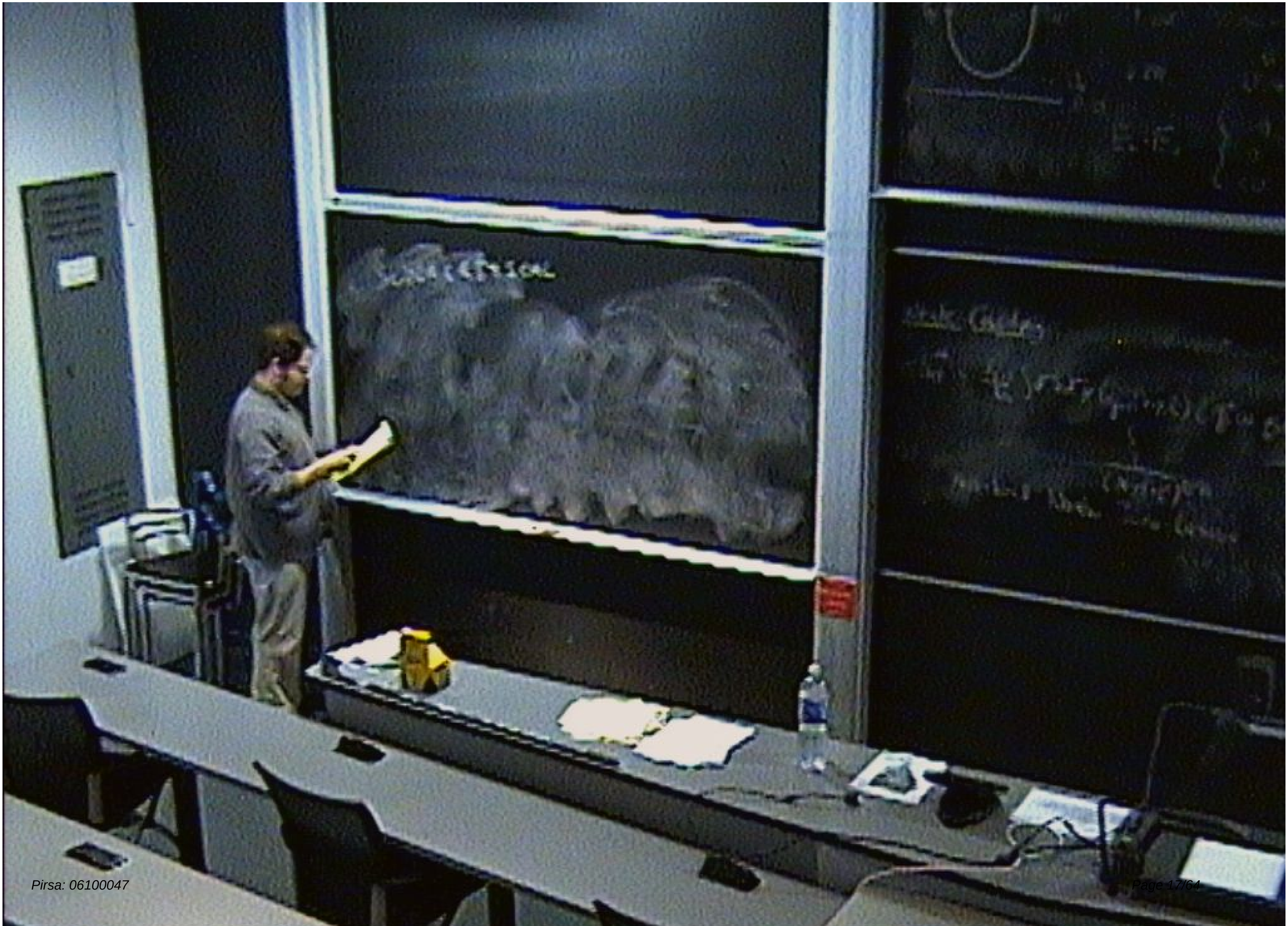

Weak Coupling

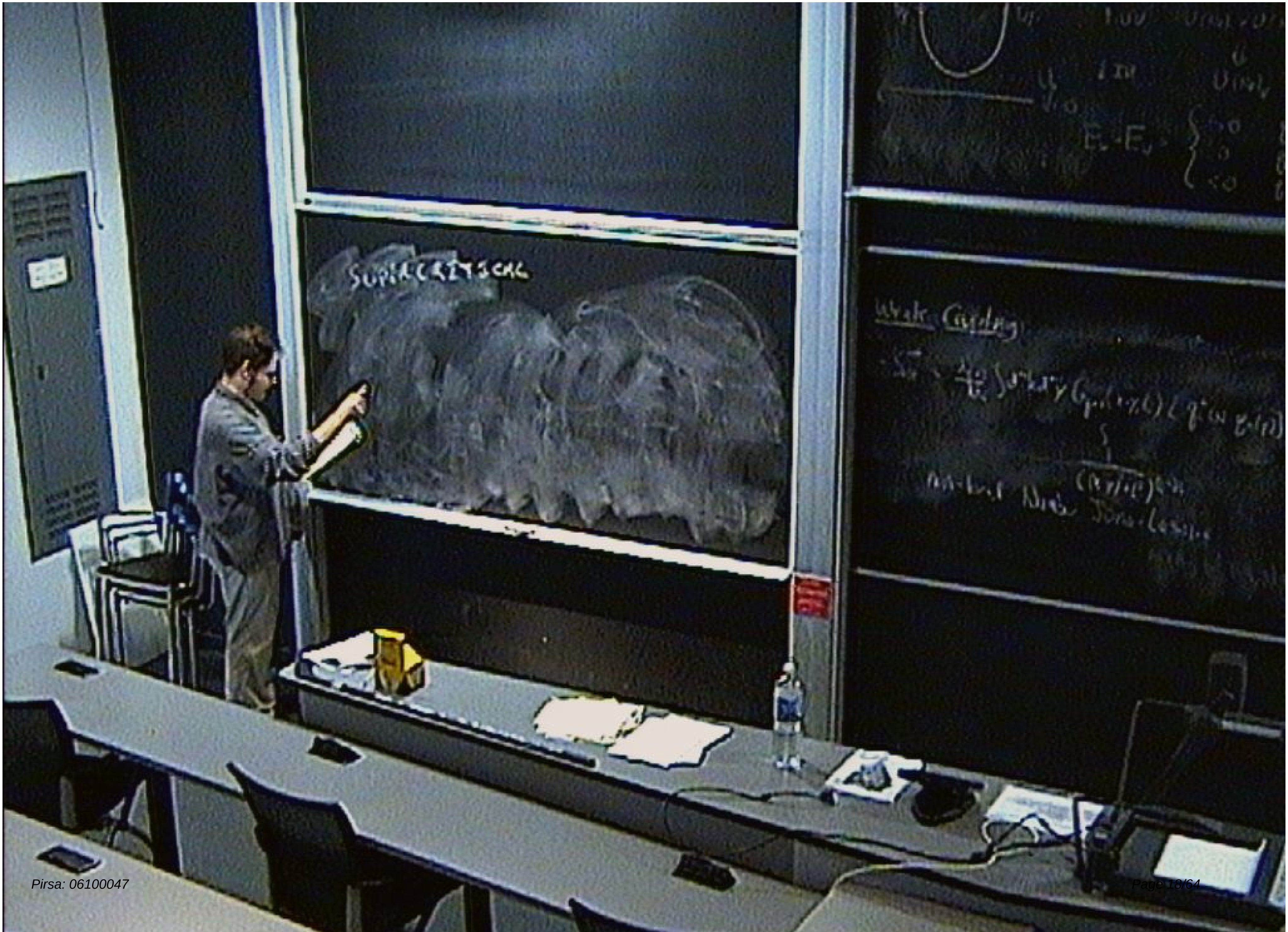

Weak Coupling

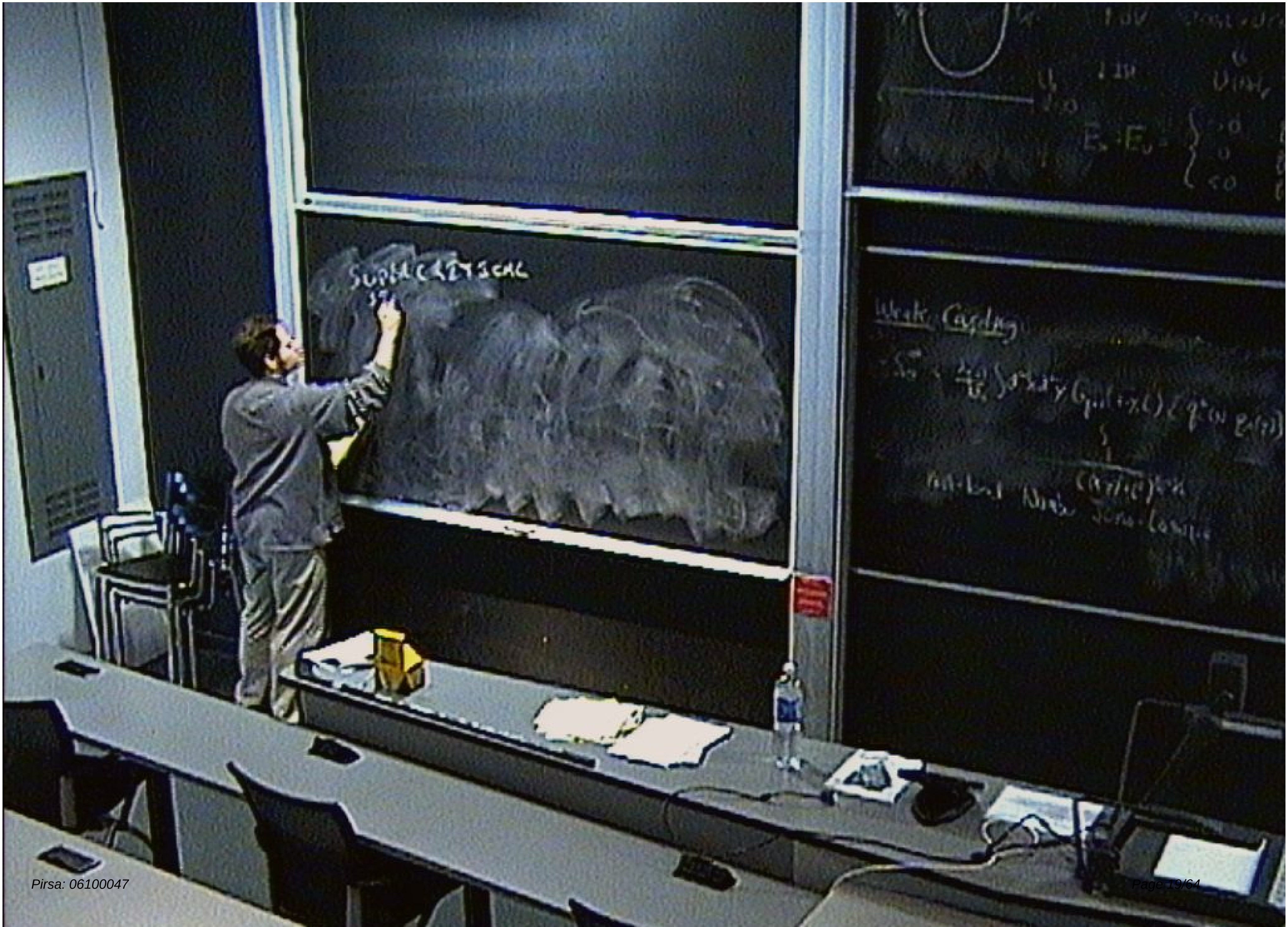


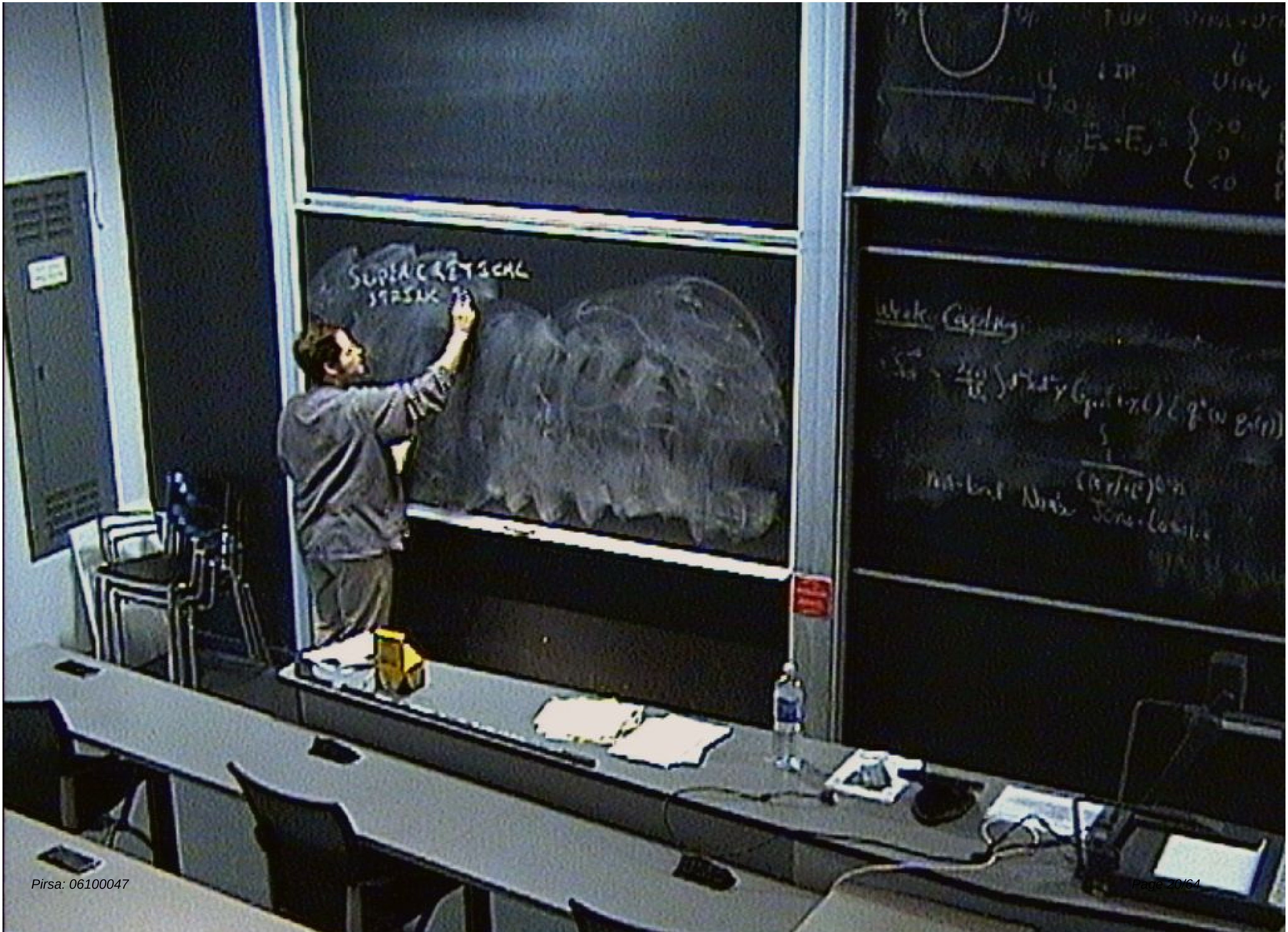


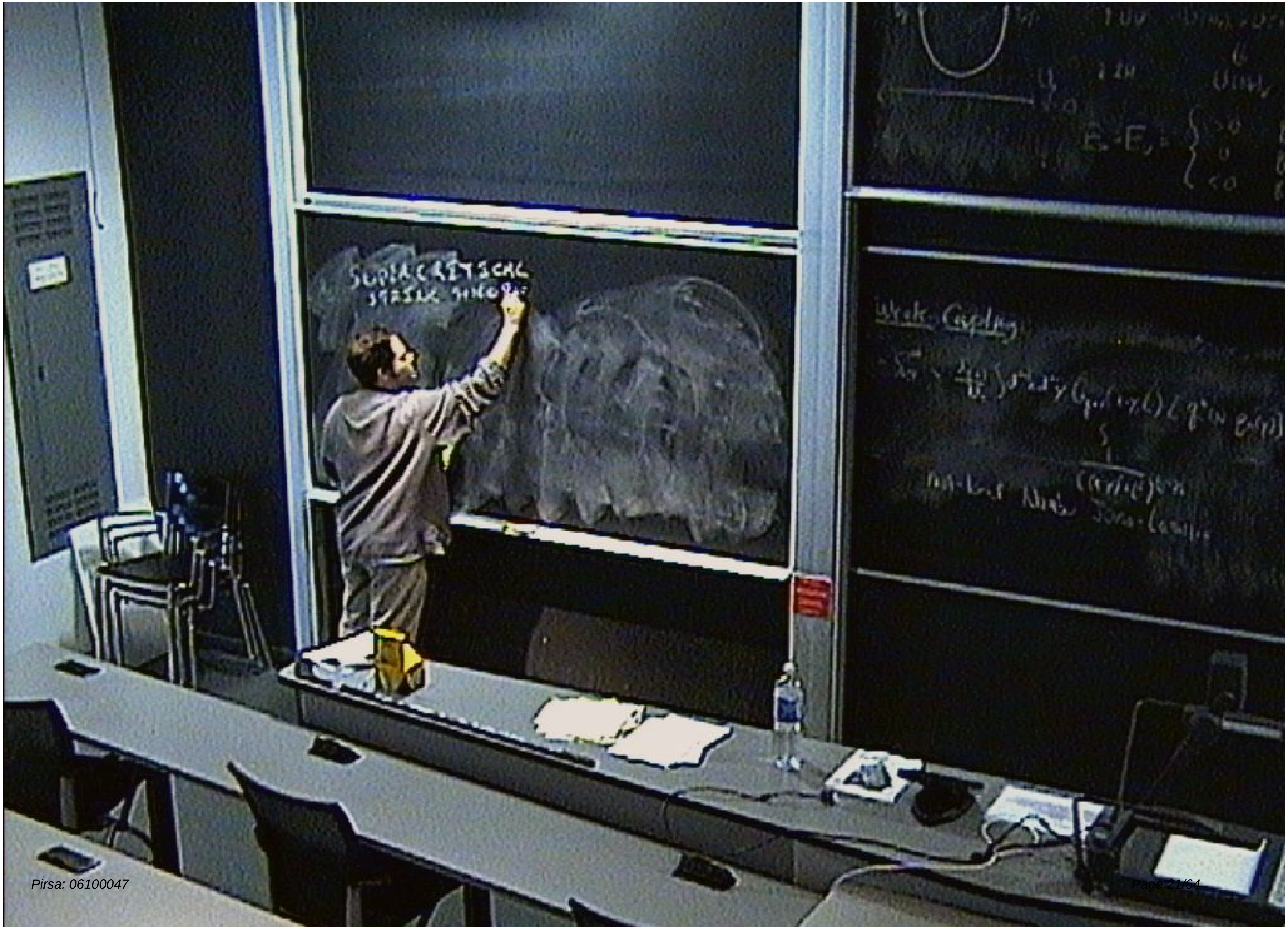

SUPERCRITICAL

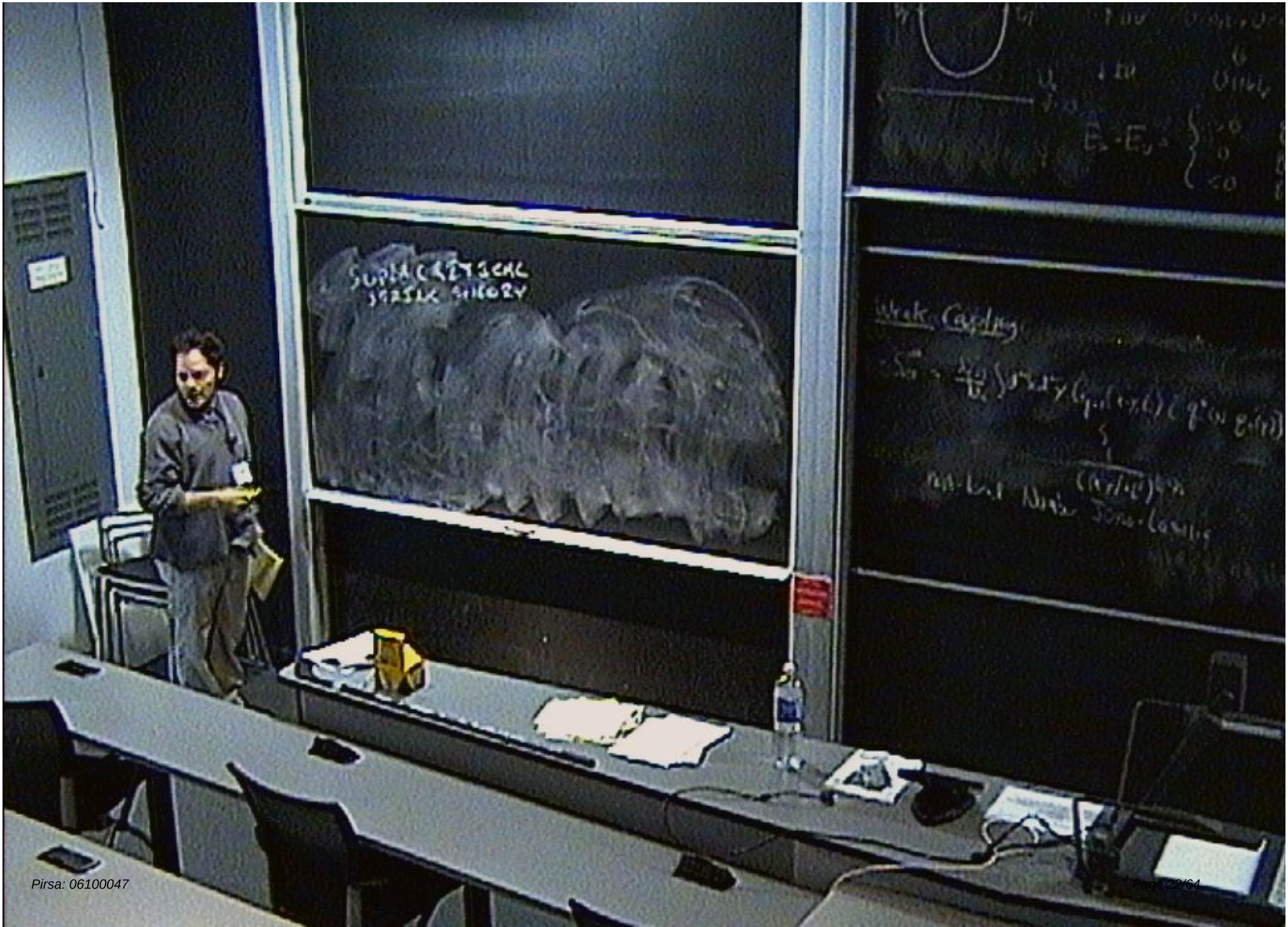


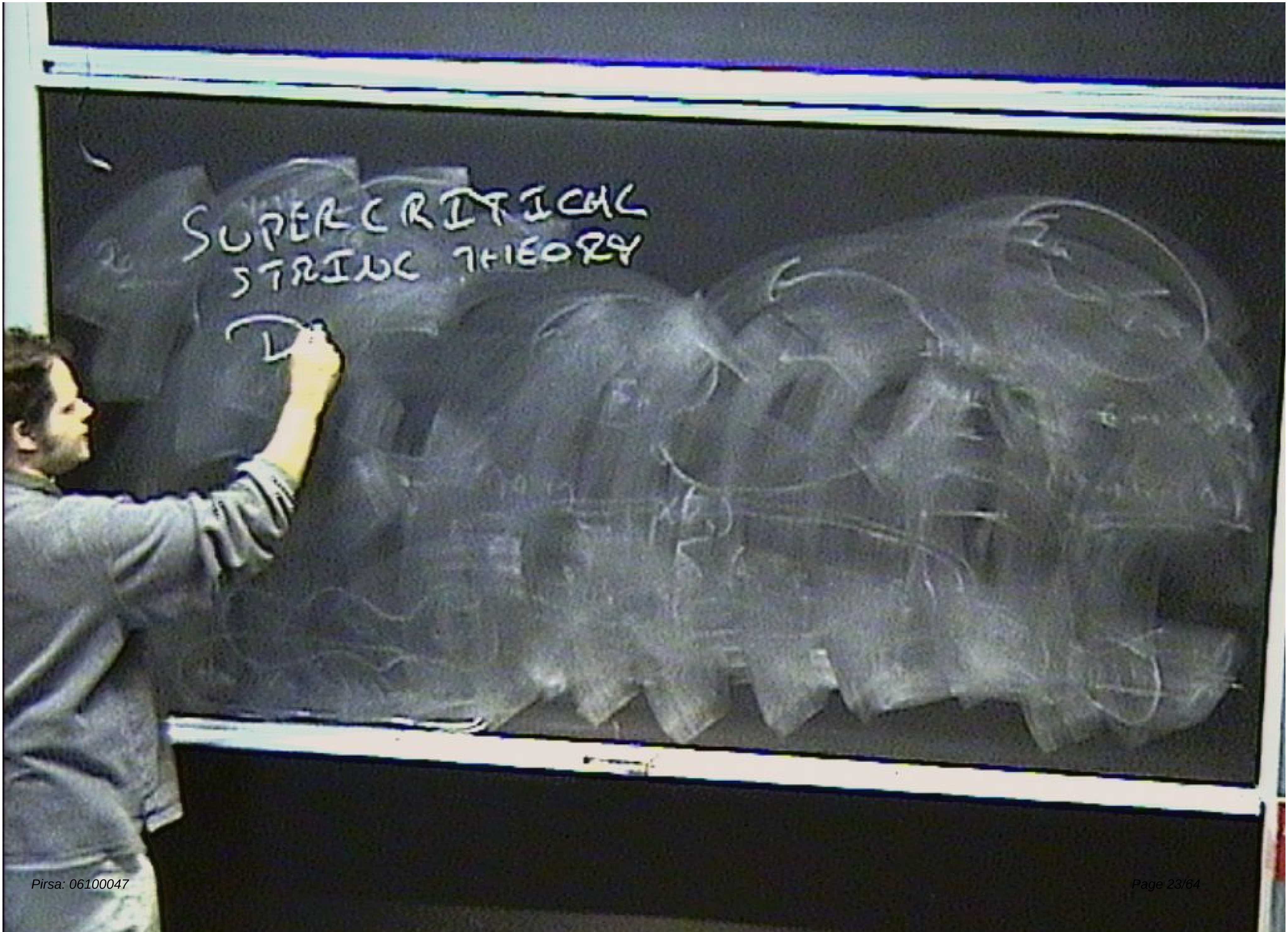

SUPERCRITICAL
Weak Coupling

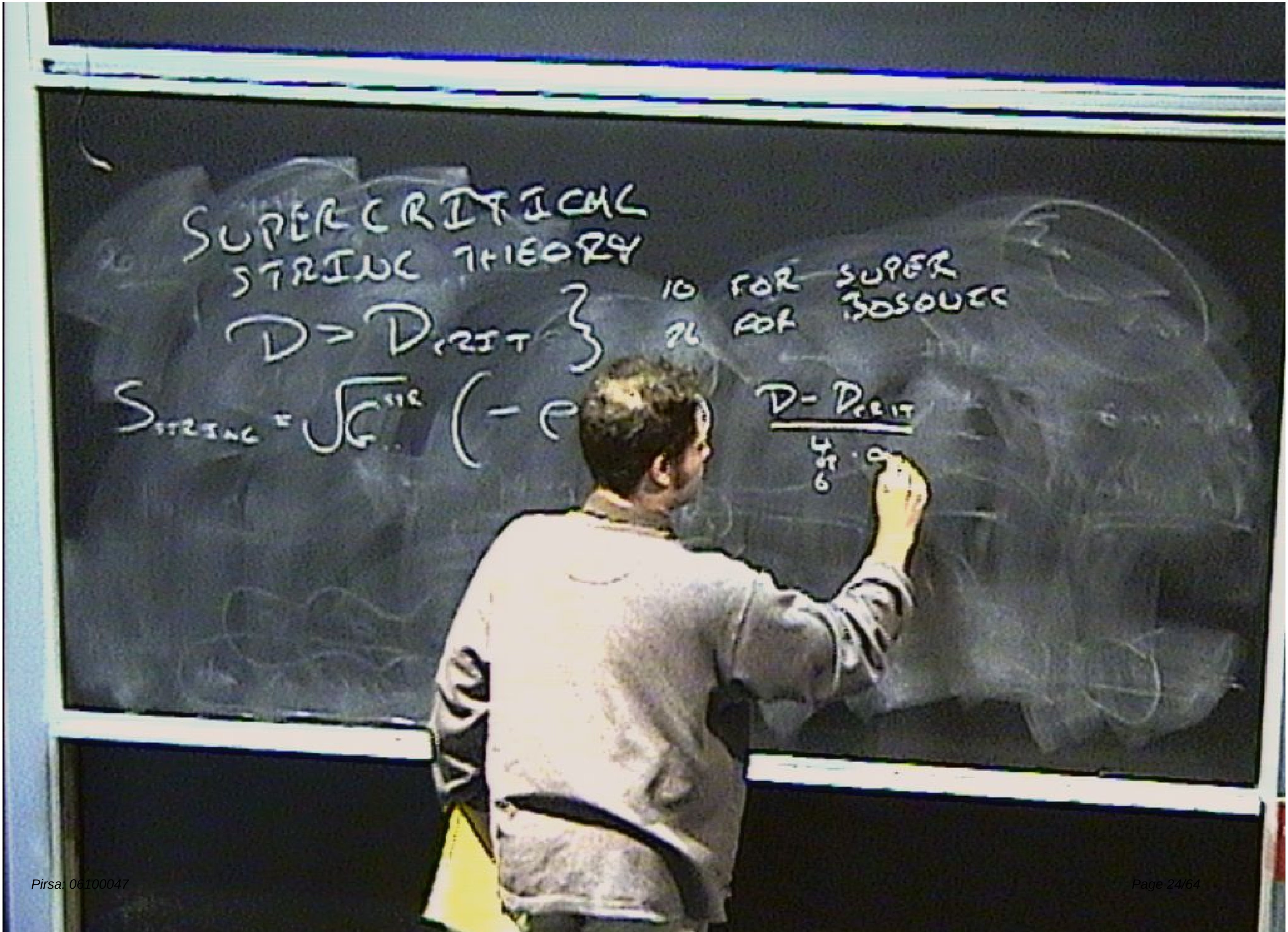

SUPERCRITICAL
Weak Coupling


SUPERCRITICAL
Weak Coupling


SUPERCRITICAL


Weak Coupling


SUPERCRITICAL
STRING THEORY
D


SUPERCRITICAL
STRING THEORY
D > D_CRIT
10 FOR SUPER
26 FOR BOSONIC
S_STRING = √G^STR (− e
D − D_CRIT

SUPERCRITICAL STRING THEORY

$$D > D_{CRIT} \left\{ \begin{array}{l} 10 \text{ FOR SUPER} \\ 26 \text{ FOR BOSONIC} \end{array} \right.$$

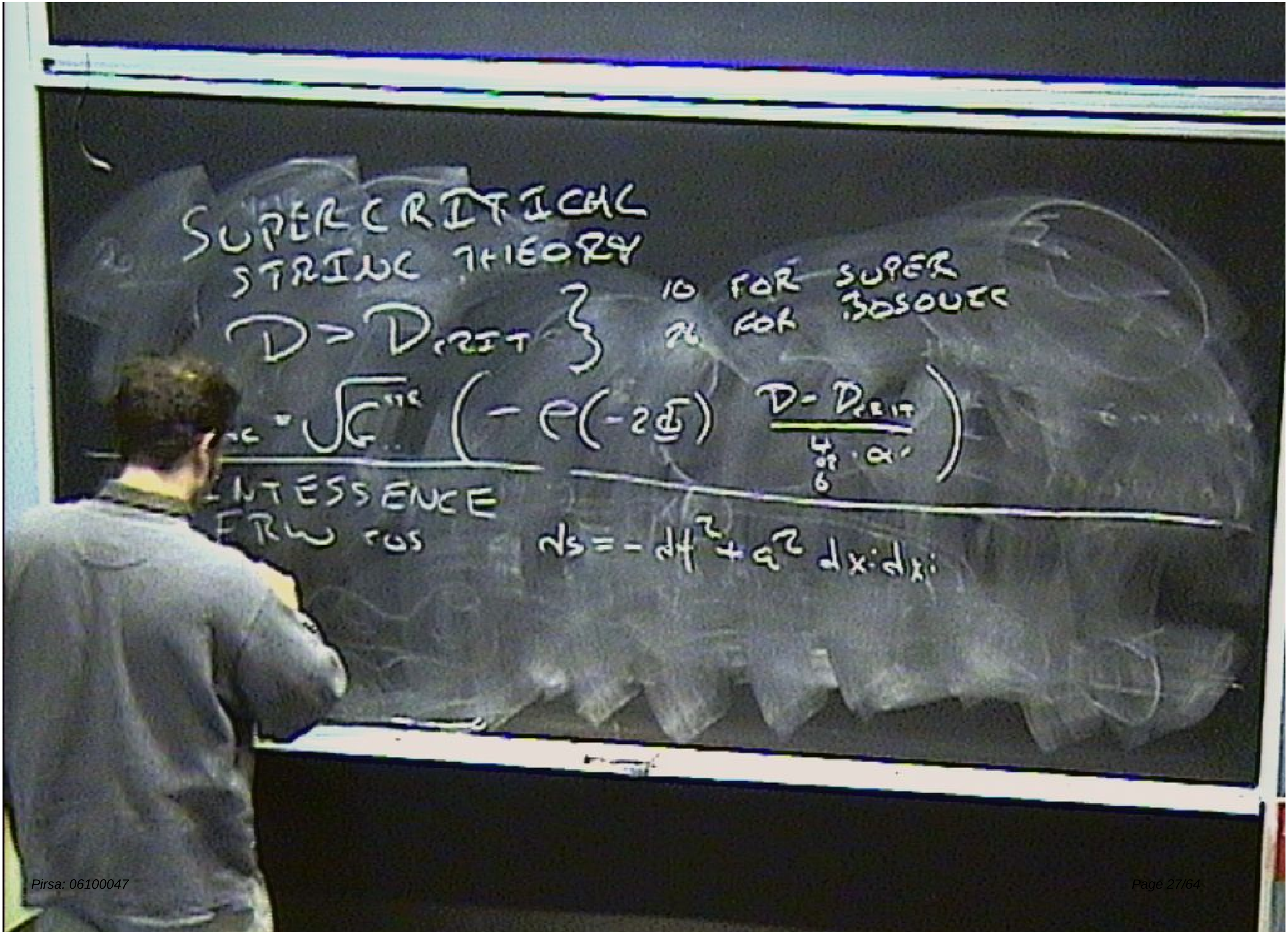
$$S_{STRING} = \int \sqrt{G^{STR}} \left(- e^{(-2\Phi)} \frac{D - D_{CRIT}}{\substack{4 \\ \text{or} \\ 6} \cdot \alpha'} \right)$$

SUPERCRITICAL STRING THEORY

$$D > D_{CRIT} \left\{ \begin{array}{l} 10 \text{ FOR SUPER} \\ 26 \text{ FOR BOSONIC} \end{array} \right.$$

$$S_{STRING} = \sqrt{G^{STR}} \left(- e^{(-2\Phi)} \frac{D - D_{CRIT}}{\frac{4}{6} \cdot \alpha'} \right)$$

QUINTESSENCE


SUPERCRITICAL
STRING THEORY
D > D_CRIT
10 FOR SUPER
26 FOR BOSONIC
√G^STR (− e(−2Φ) (D − D_CRIT)/(4 or 6 · α'))
NTESSENCE
FRW cos
ds = − dt² + a² dx_i dx_i

SUPERCRITICAL
STRING THEORY

$D > D_{CRIT}$ $\Big\}$ 10 FOR SUPER, 26 FOR BOSONIC

$$S_{STRING} = \sqrt{G^{STR}} \left(- e(-2\Phi) \frac{D - D_{CRIT}}{4 \text{ or } 6 \cdot \alpha'} \right)$$

QUINTESSENCE
FRW COS
$ds = -dt^2 + a^2 dx_i dx_i$
$-1 < w < \ldots$

SUPERCRITICAL
STRING THEORY

$D > D_{crit}$ $\Big\}$ 10 FOR SUPER
26 FOR BOSONIC

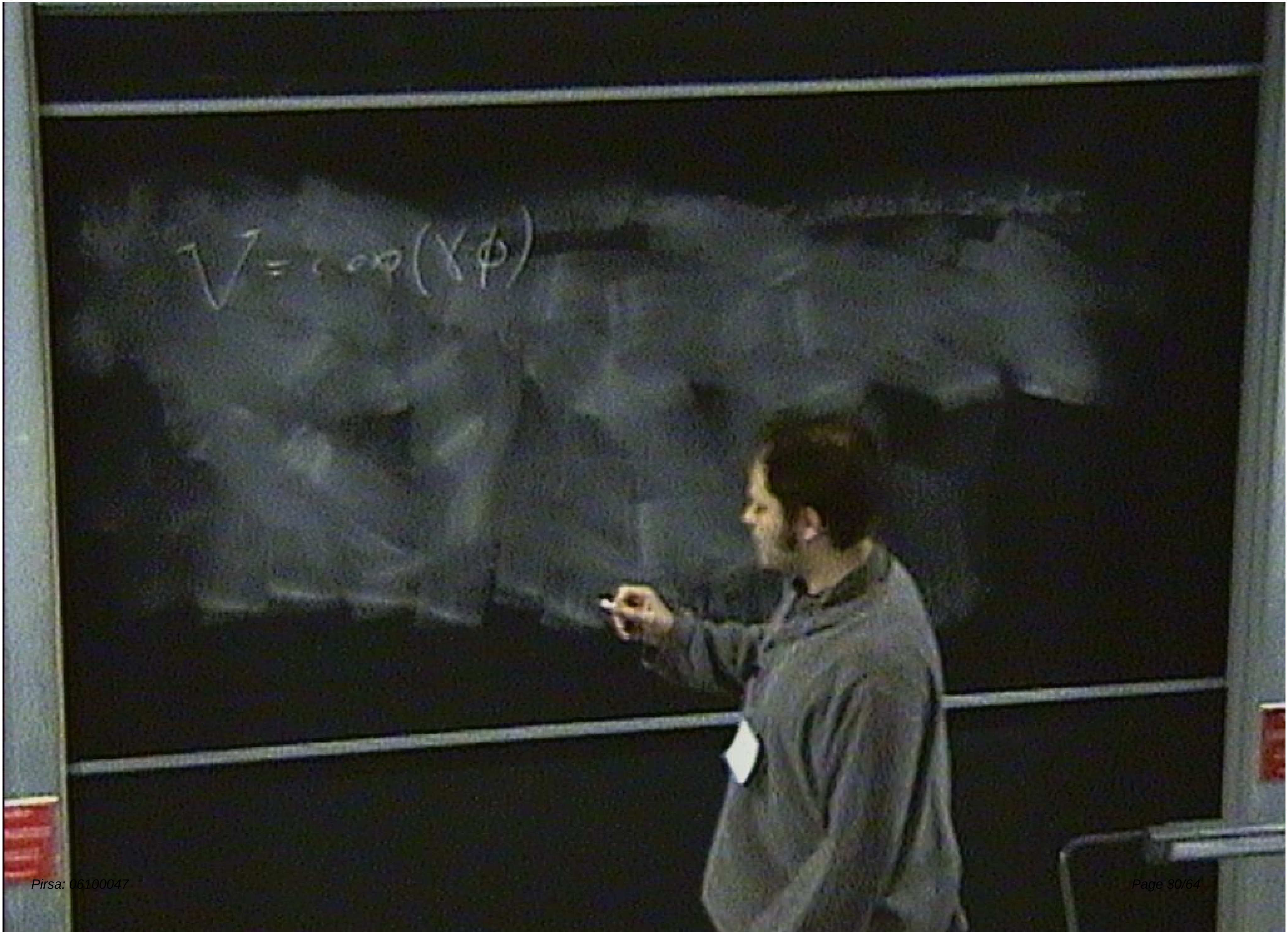
$$S_{string} = \int \sqrt{G}^{\,11} \left(- e^{(-2\Phi)} \frac{D - D_{crit}}{4 \text{ or } 6 \cdot \alpha'} \right)$$

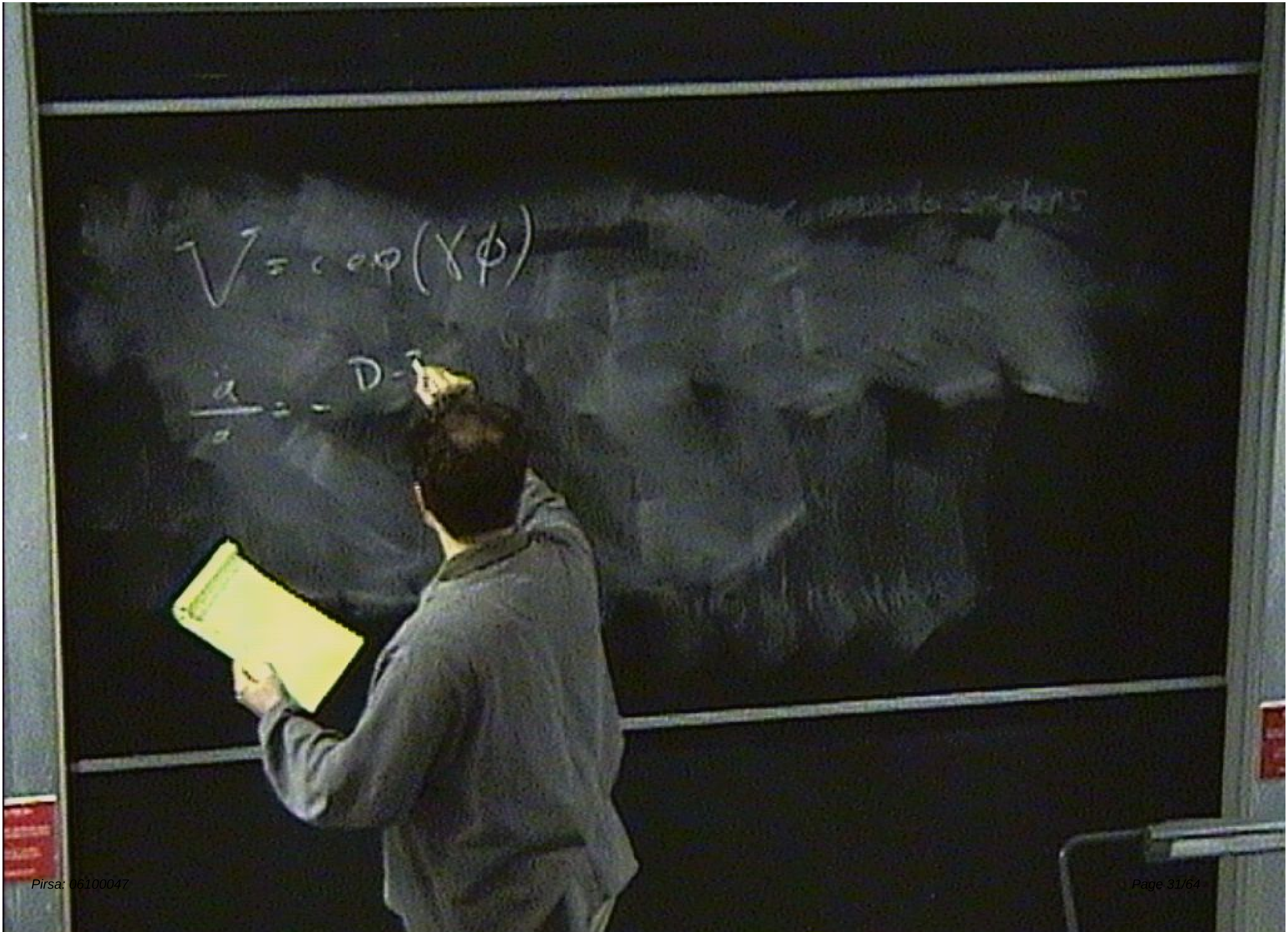
QUINTESSENCE

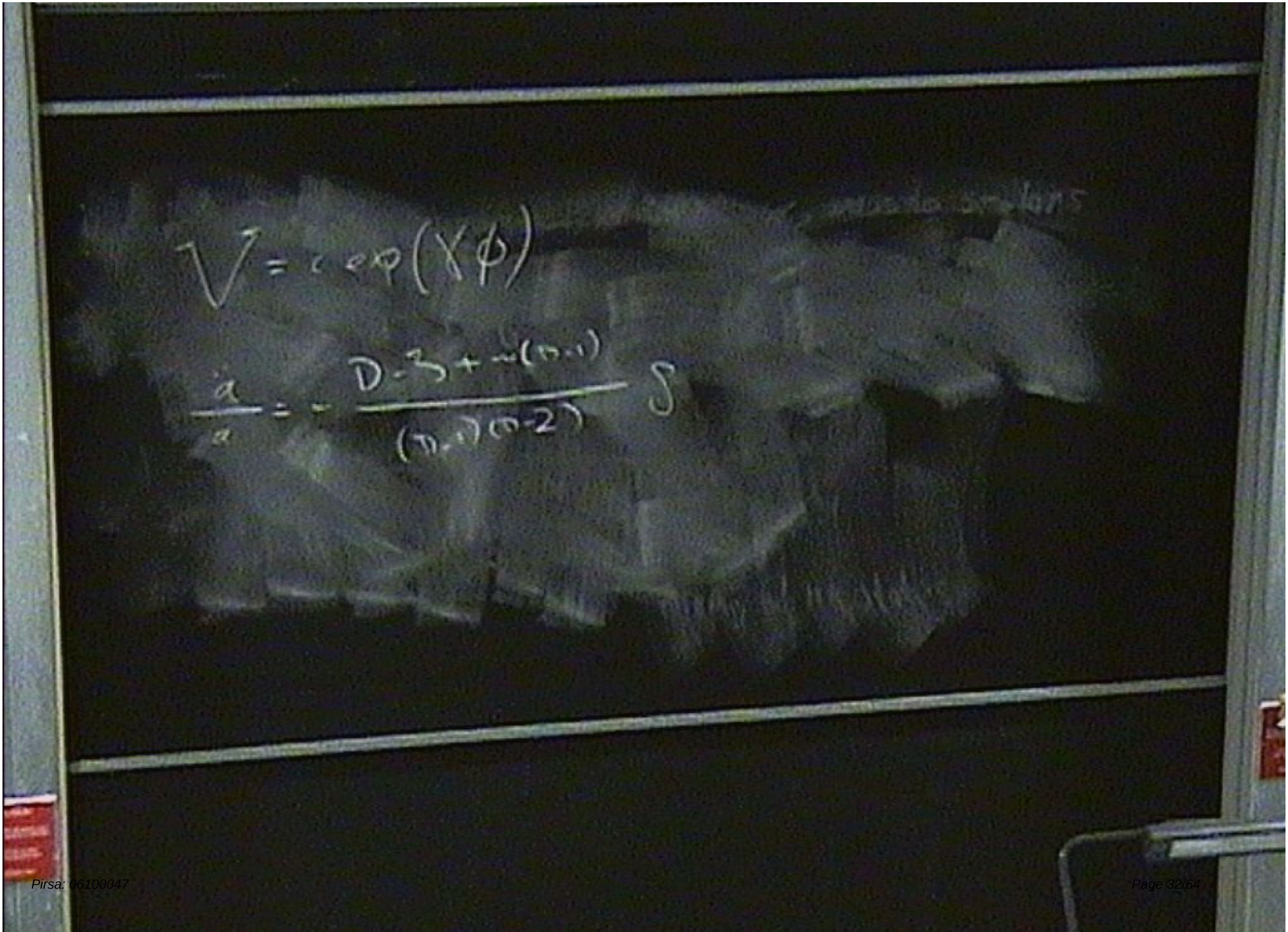
FRW cos

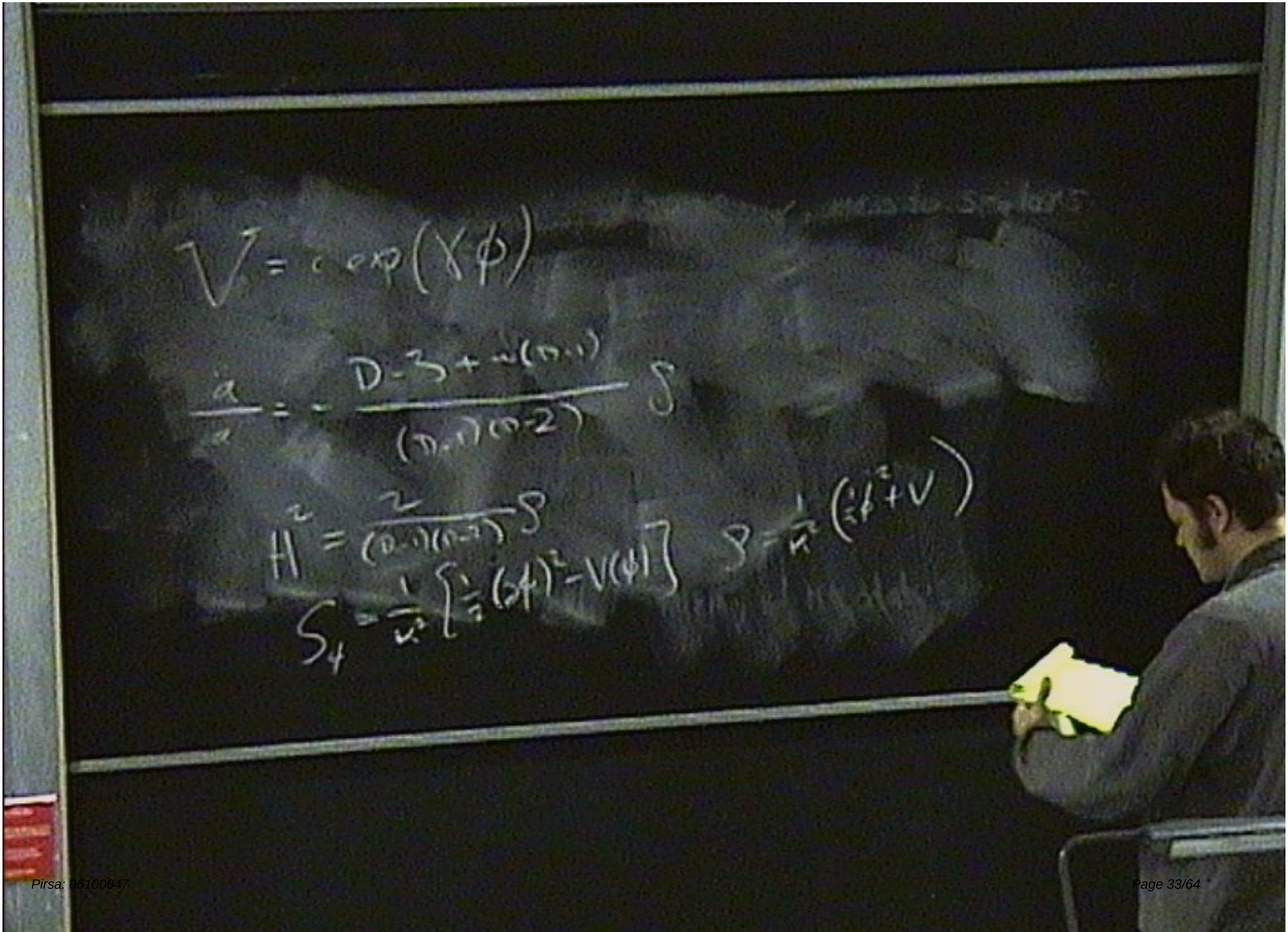
$$ds = -dt^2 + a^2\, dx^i dx_i$$

$$-1 < w < \dots \frac{1}{3}$$

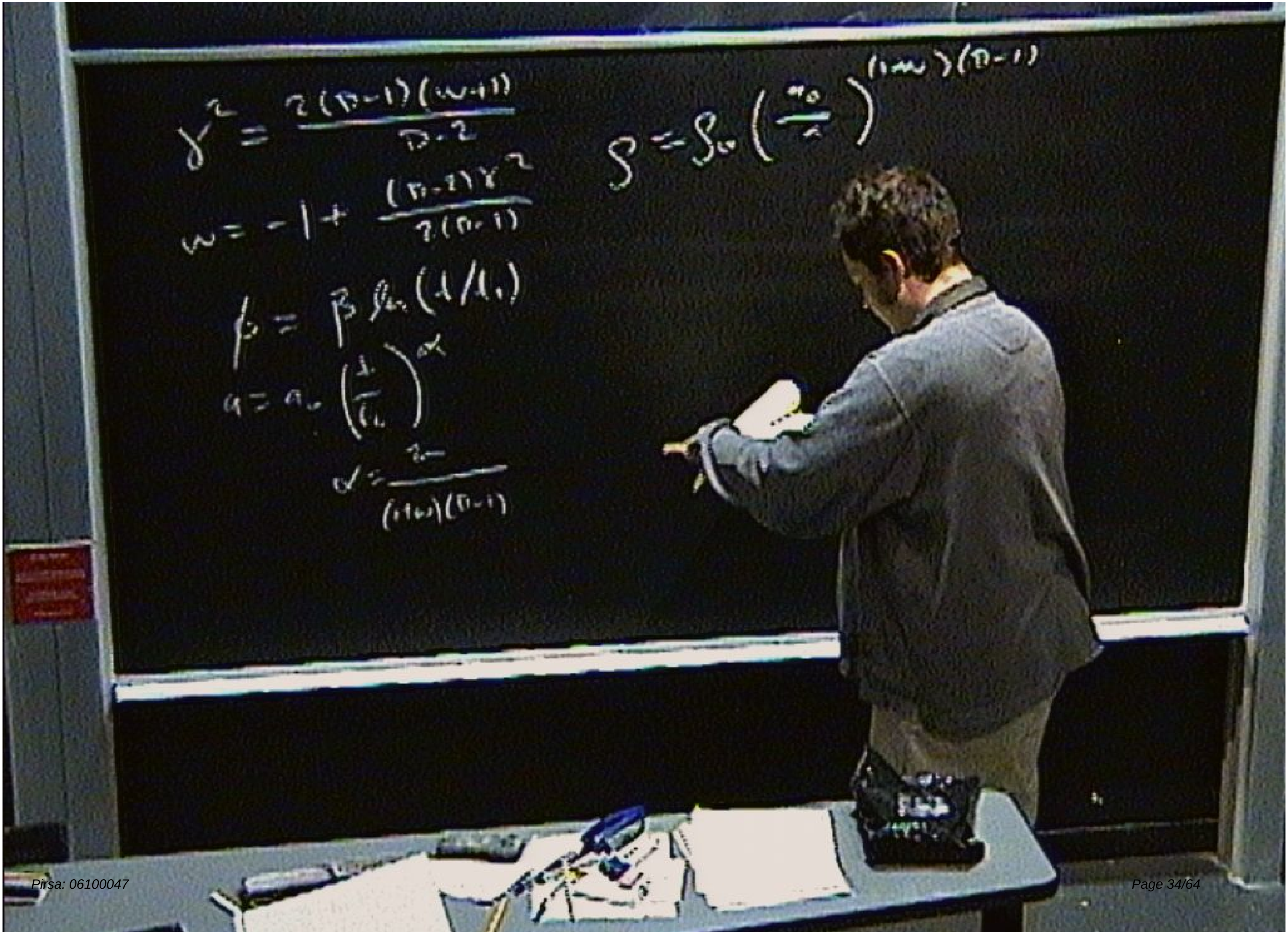

$V = \exp(\gamma \phi)$

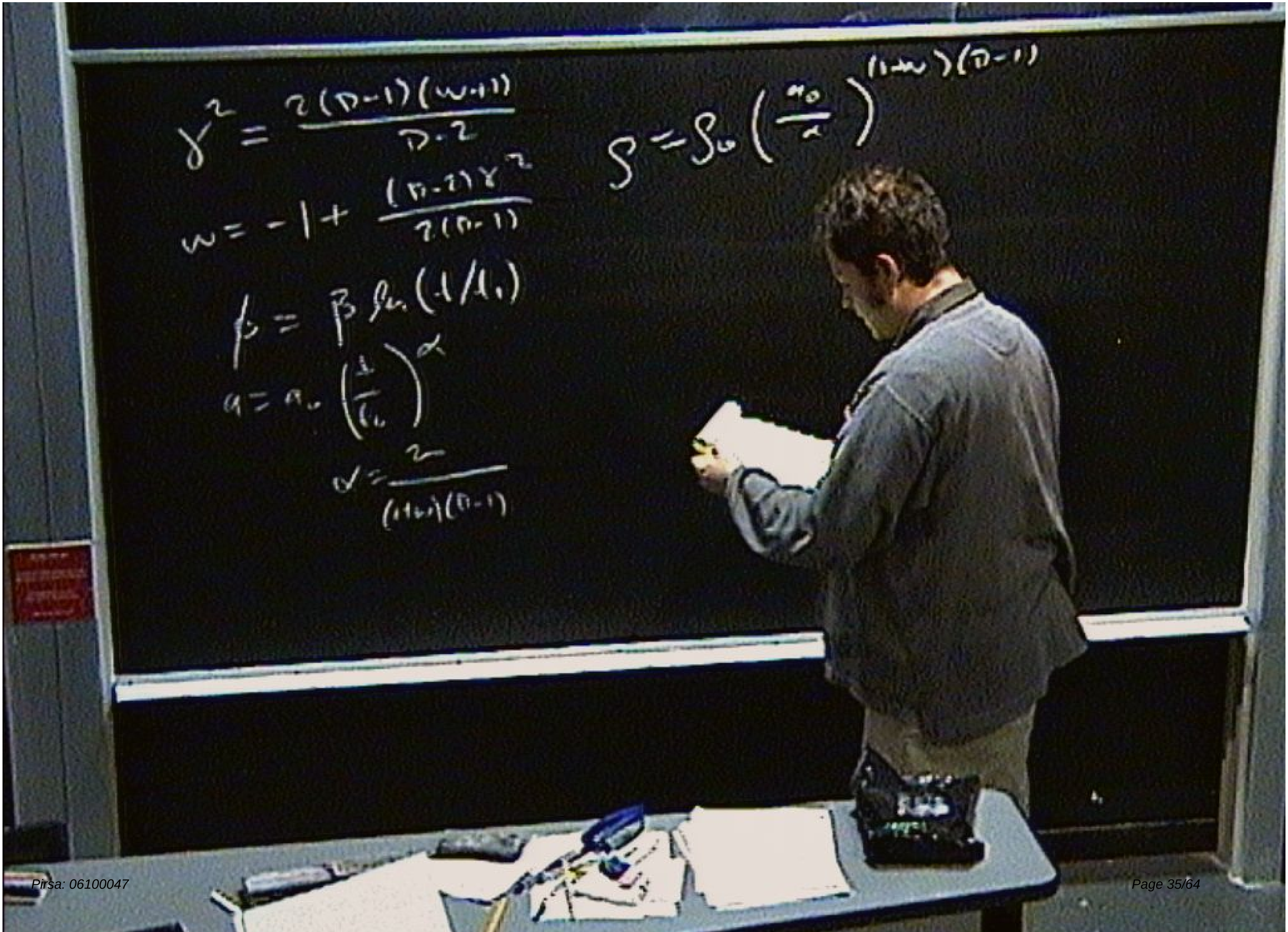

V = c exp(γφ)


$V = c\exp(\gamma\phi)$
$\frac{\ddot{a}}{a} = -\frac{D-3+\dots(n-1)}{(n-1)(n-2)}\,\delta$



$V = c\exp(\gamma\phi)$
$\frac{\dot a}{a} = -\frac{D-3+\omega(n-1)}{(n-1)(n-2)}\rho$
$H^2 = \frac{2}{(n-1)(n-2)}\rho$
$\rho = \frac{1}{\kappa^2}\left(\frac{1}{2}\dot\phi^2 + V\right)$
$S_4 = \frac{1}{\kappa^2}\left[\frac{1}{2}(\partial\phi)^2 - V(\phi)\right]$


$\gamma^2 = \frac{2(D-1)(w+1)}{D-2}$
$w = -1 + \frac{(D-2)\gamma^2}{2(D-1)}$
$p = \beta \rho_m (t/t_1)$
$a = a_0 \left(\frac{t}{t_0}\right)^{\alpha}$
$\alpha = \frac{2}{(1+w)(D-1)}$
$\rho = \rho_0 \left(\frac{a_0}{a}\right)^{(1+w)(D-1)}$



$\gamma^2 = \frac{2(D-1)(w+1)}{D-2}$
$w = -1 + \frac{(D-2)\gamma^2}{2(D-1)}$
$\phi = \beta \ln(t/t_0)$
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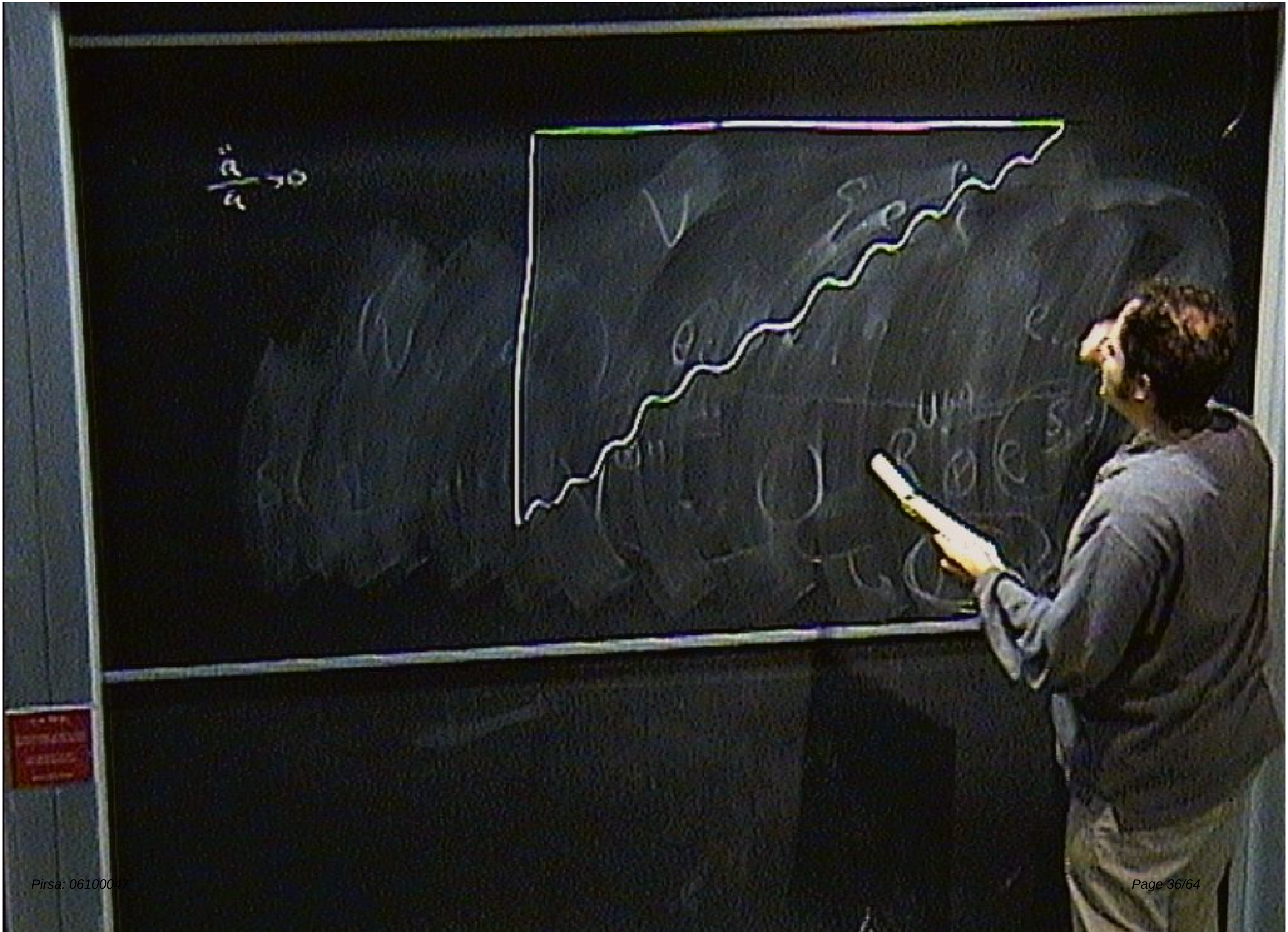
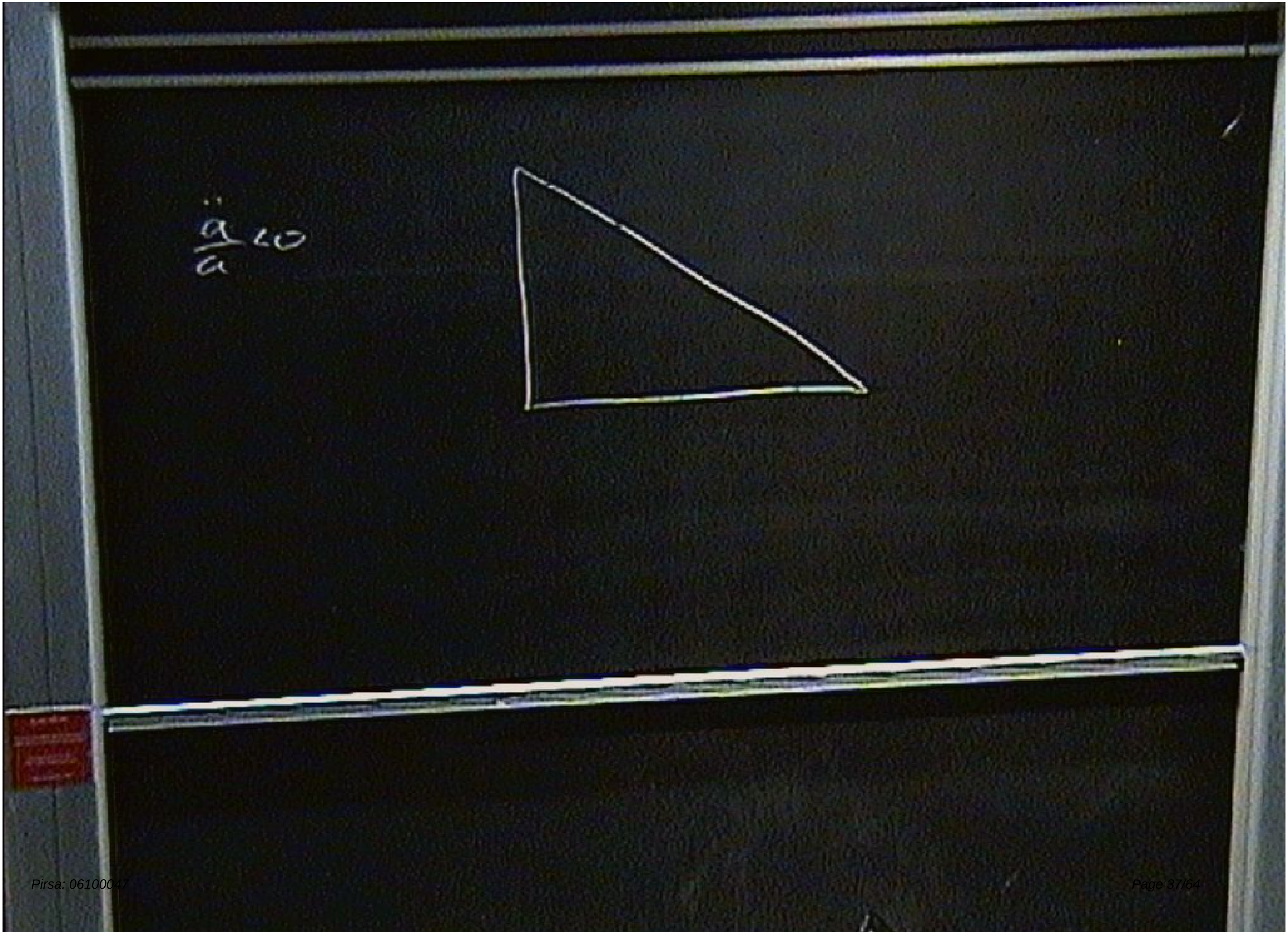
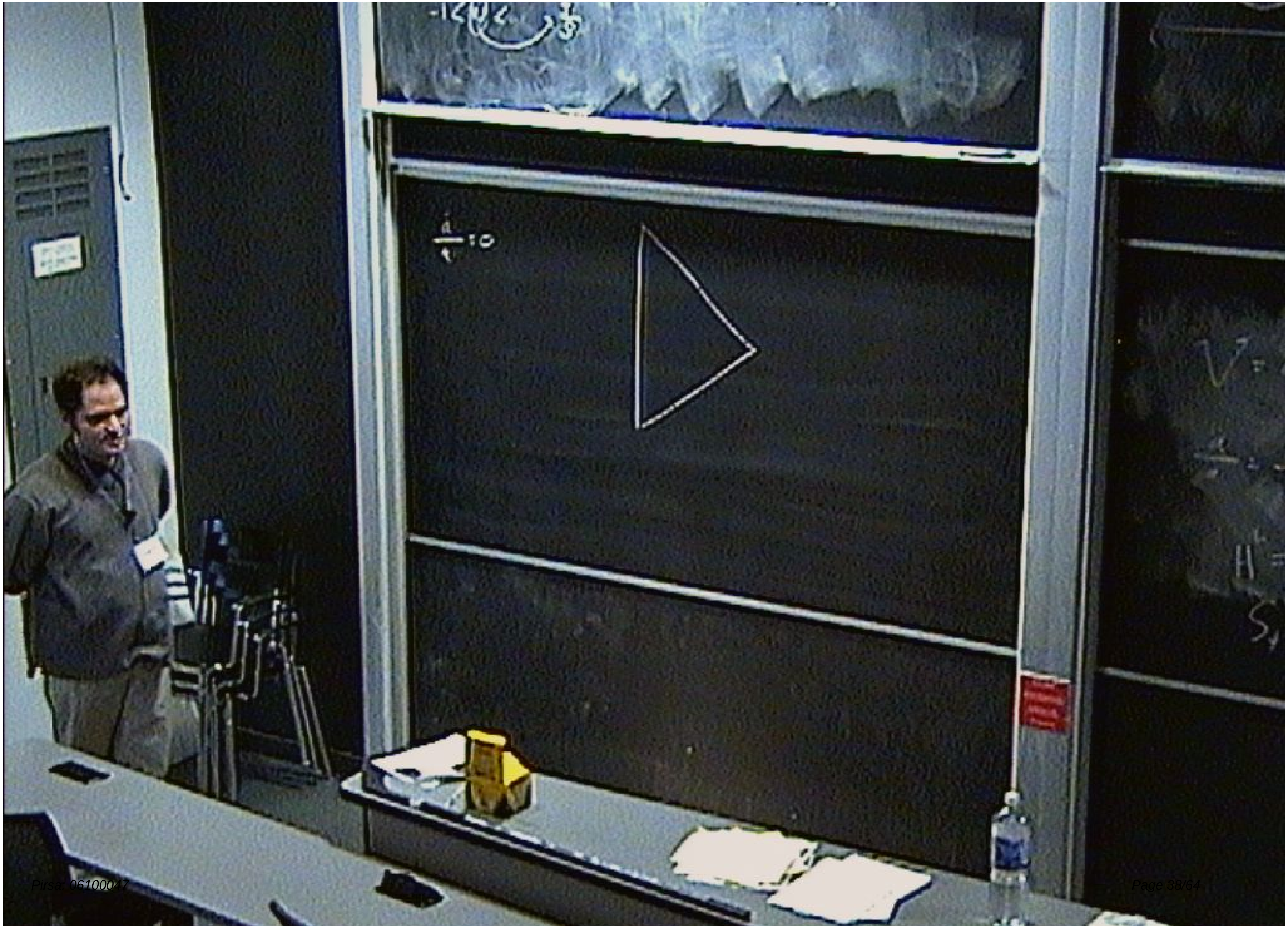
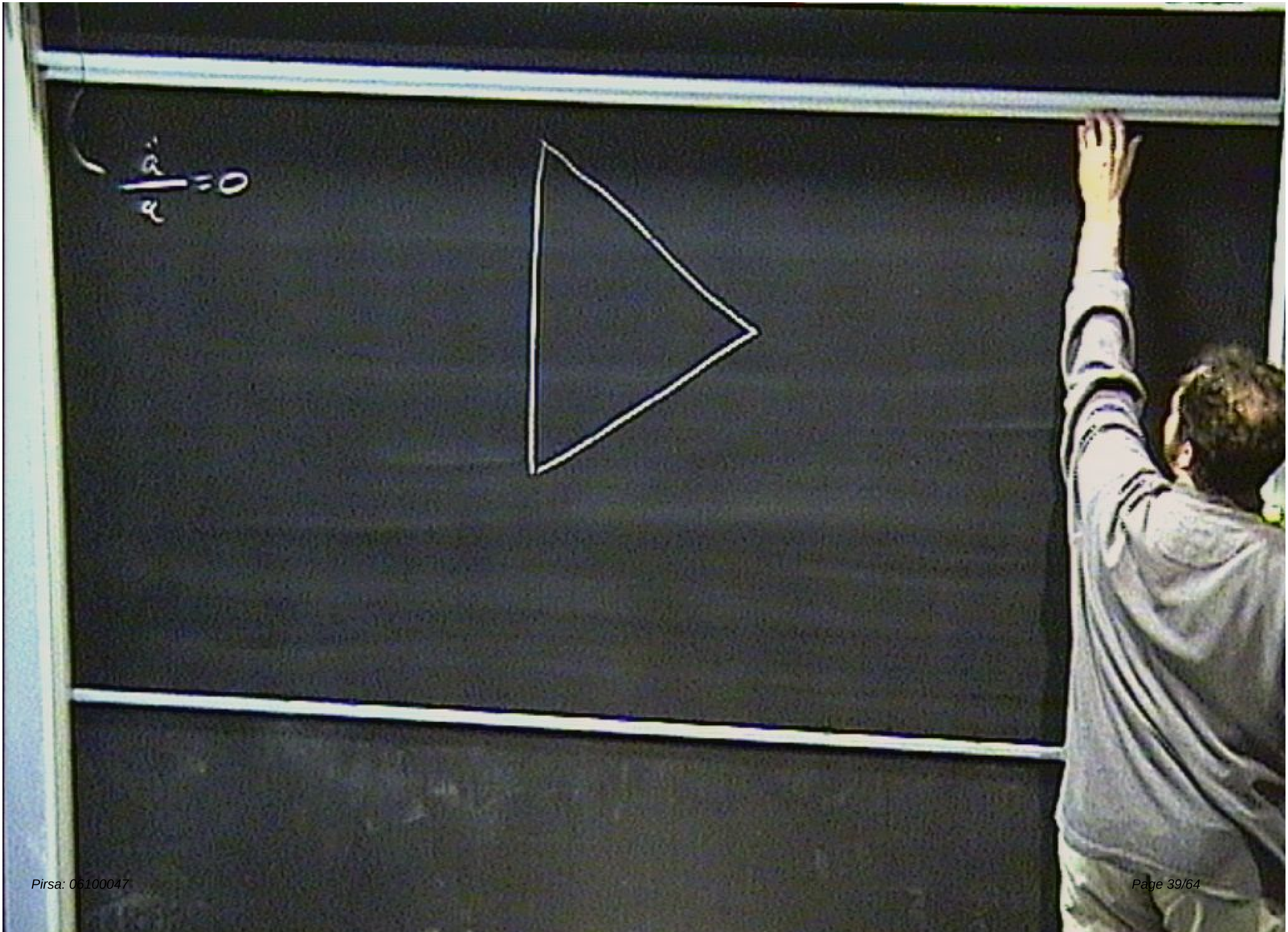
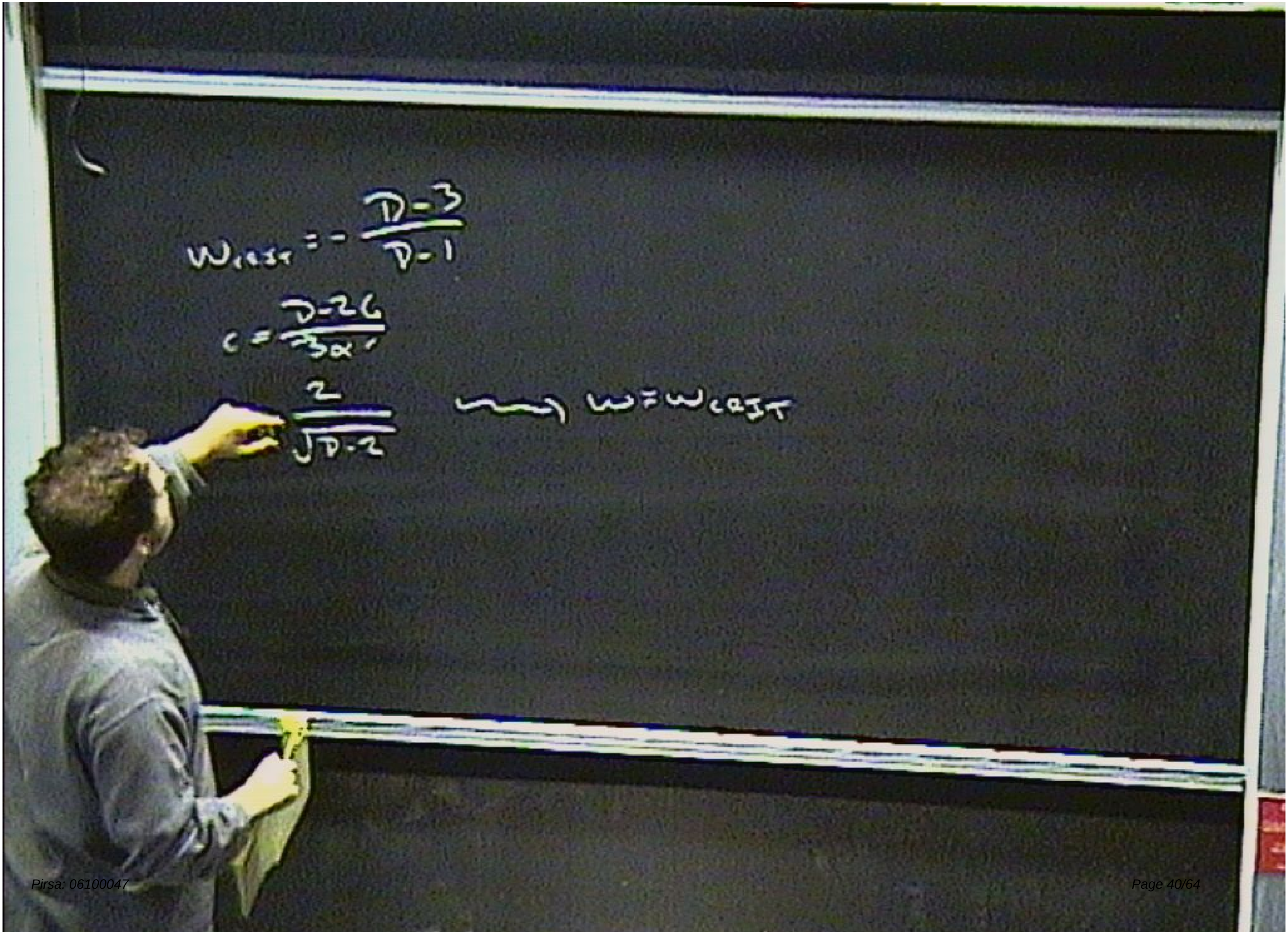
$\alpha = \frac{2}{(1+w)(D-1)}$
$\rho = \rho_0 \left(\frac{a_0}{a}\right)^{(1+w)(D-1)}$


$\frac{\ddot{a}}{a} > 0$


$\frac{\ddot{a}}{a} < 0$




$\frac{\dot{a}}{a} = 0$


$w_{crit} = -\frac{D-3}{D-1}$
$c = \frac{D-26}{3\alpha'}$
$\frac{2}{\sqrt{D-2}}$
$w = w_{crit}$

$$\frac{\dot{a}}{a} = 0$$

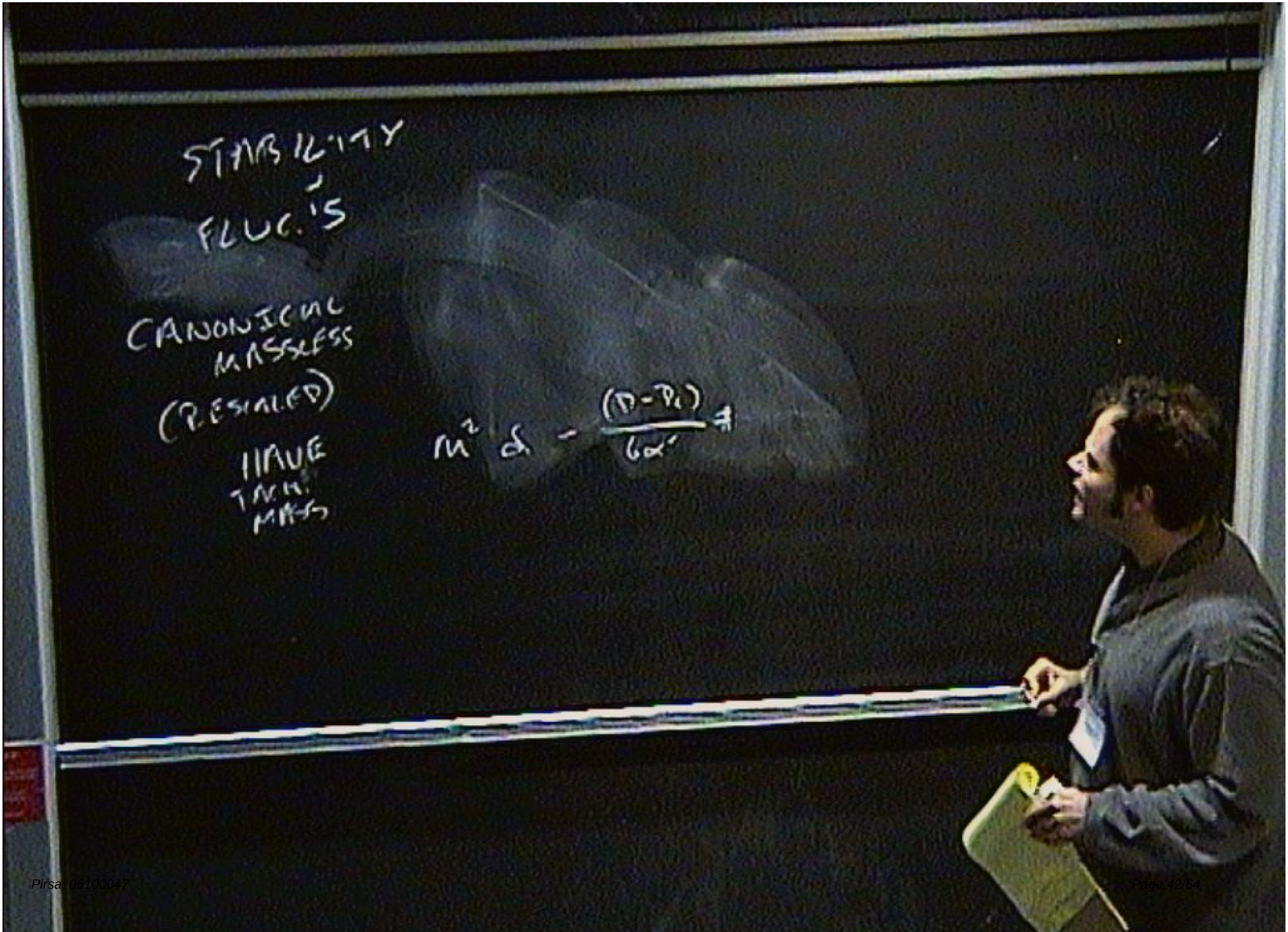
WEYL REGIME

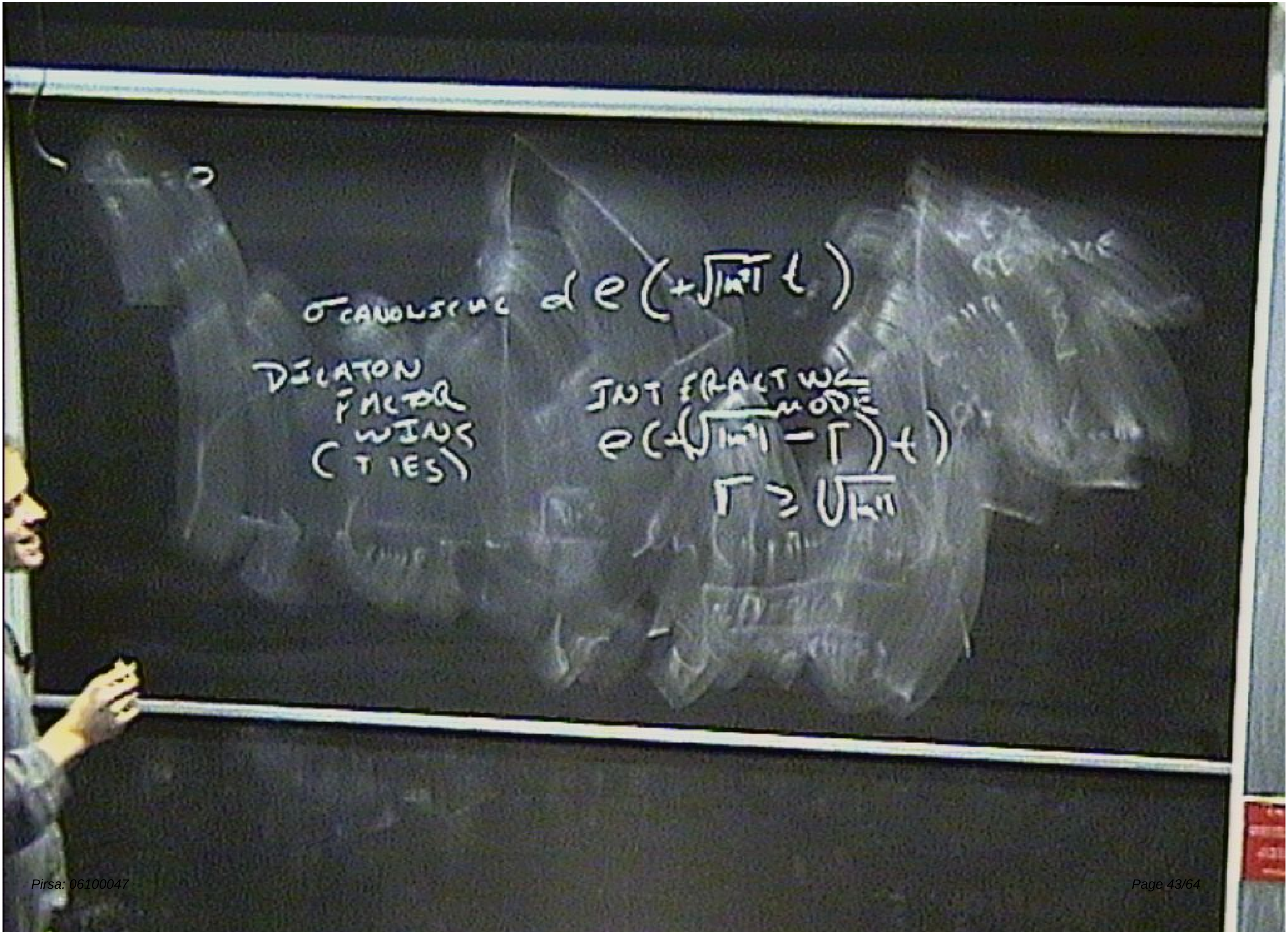
$$C^{STR}_{..} = \xi_{..}$$

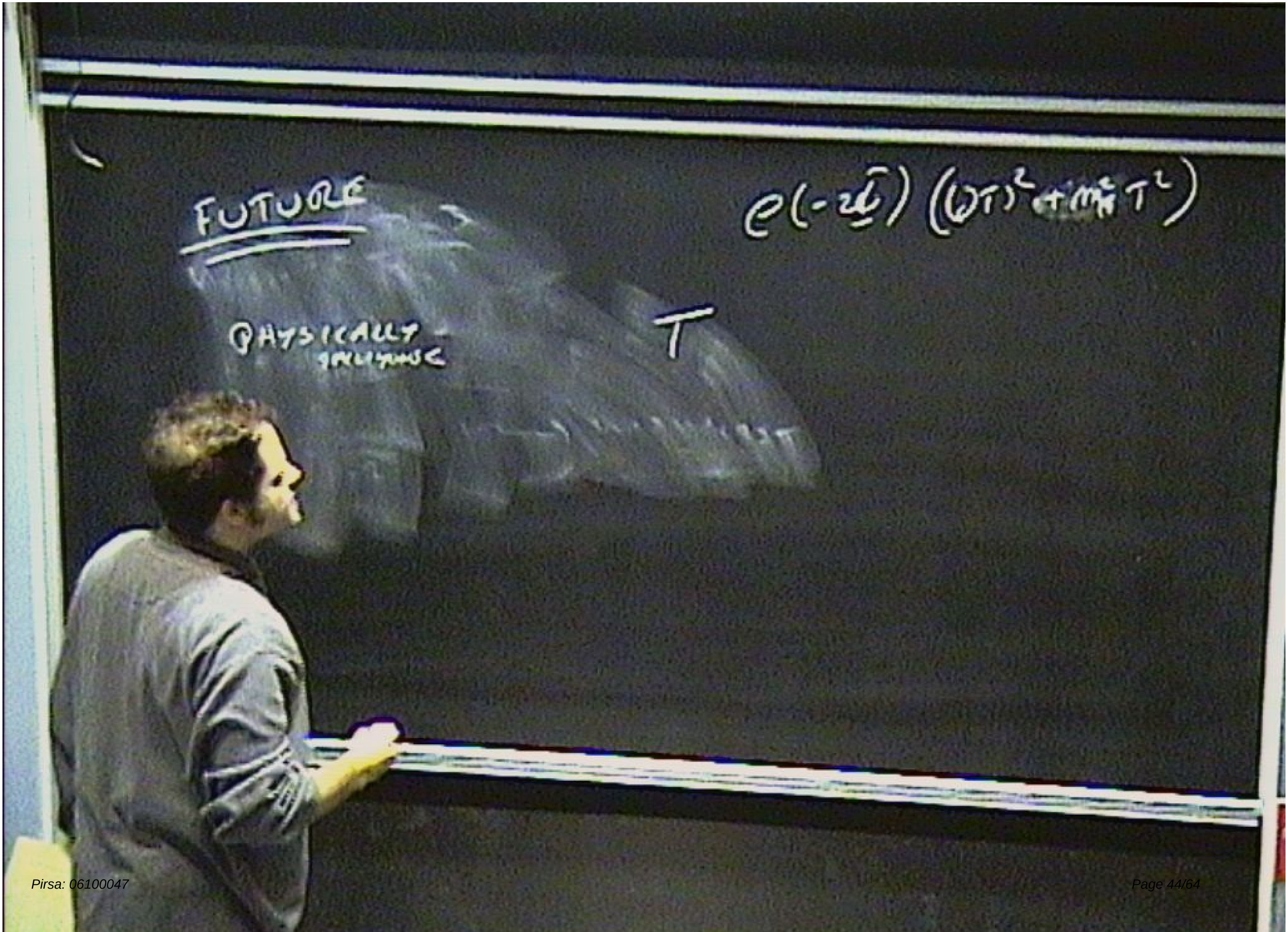
$$\bar{\phi} = -b\, t_{CONF}$$

$$t_{CONF} = -\frac{\sqrt{D-2}}{b} \ln\left(t_{FRW} H_0\right)$$

$$b = -\sqrt{\frac{2(D-26)}{3\alpha'(D-2)}}$$


STABILITY
FLUC.'S
CANONICAL
MASSLESS
(RESCALED)
HAVE
TACH.
MASS
$m^2 \propto -\frac{(D-D_c)}{6\alpha'}$


σ CANONICAL ∝ e(+√|m²| t)
DILATON FACTOR WINS (TIES)
INTERACTING MODE
e(+(√|m²| − Γ) t)
Γ ≥ √|m²|


FUTURE
T

FUTURE

PHYSICALLY
[illegible]

$$e(-2\hat{\imath})\left((\omega T)^2 + m_{\pi}^2 T^2\right)$$

$T e(+\hat{\imath})$ grows with time

FUTURE

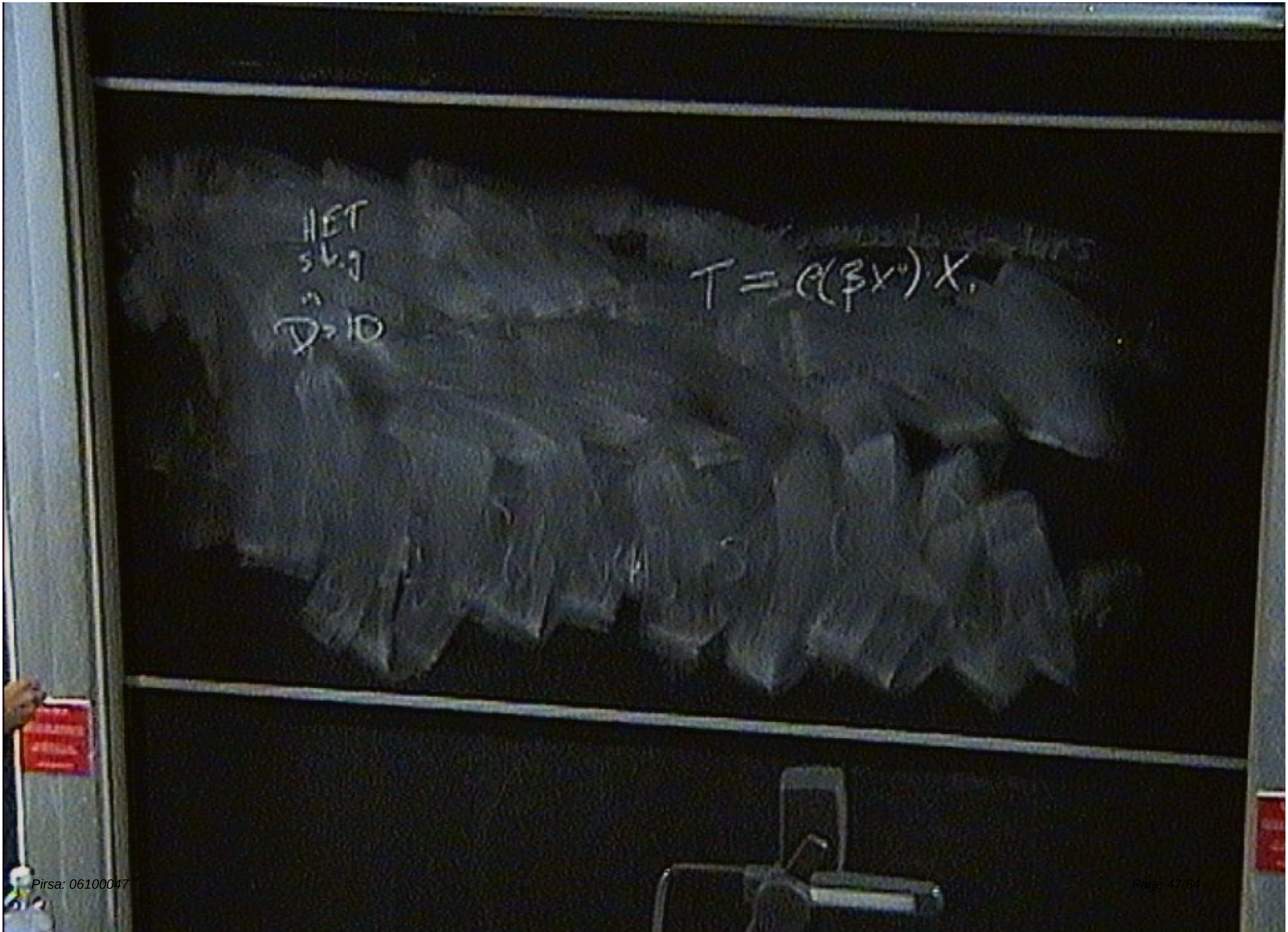
$$e(-2\hat{\phi})\left((\partial T)^2 + m_T^2 T^2\right)$$

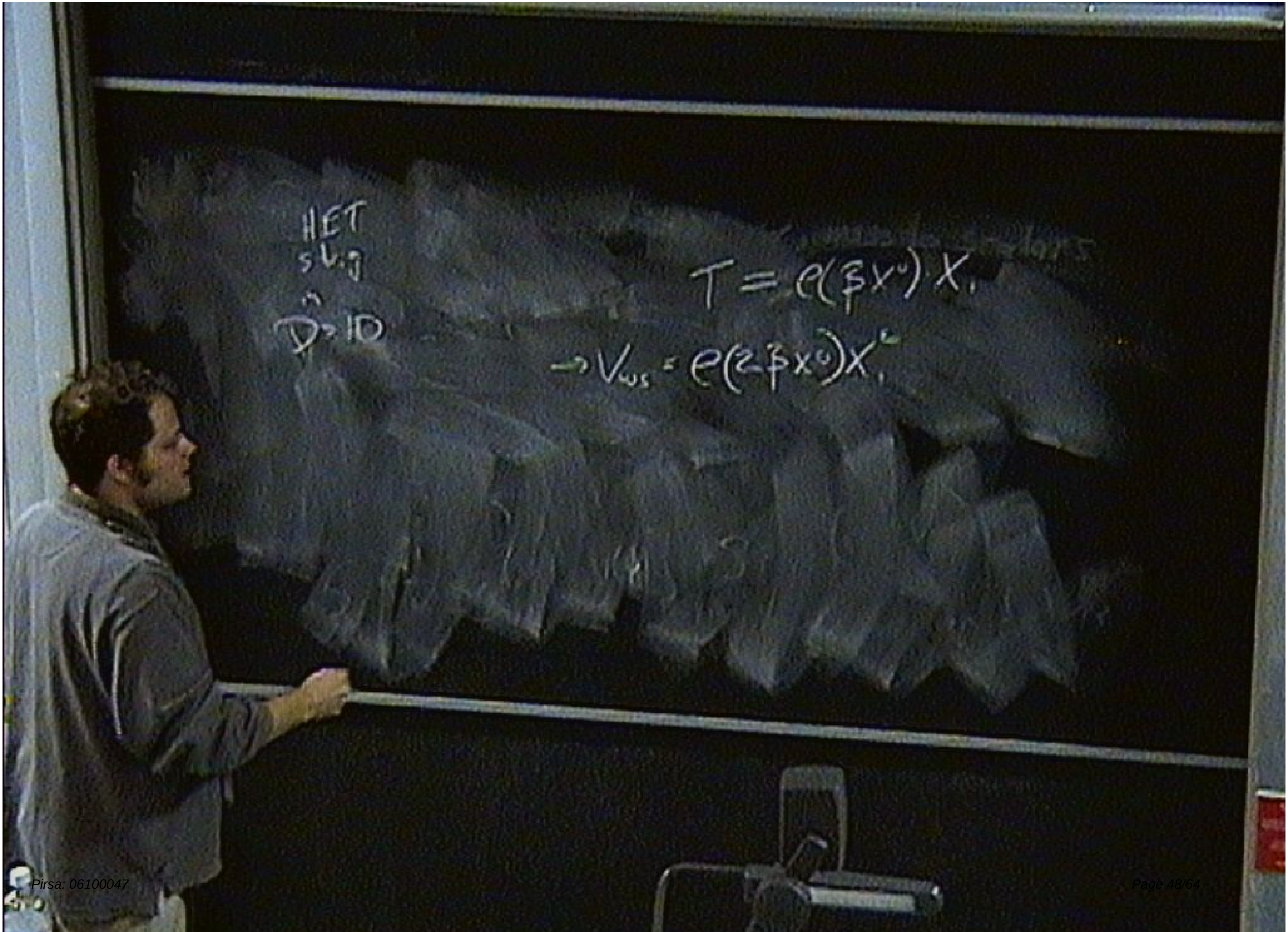
PHYSICALLY SENSIBLE

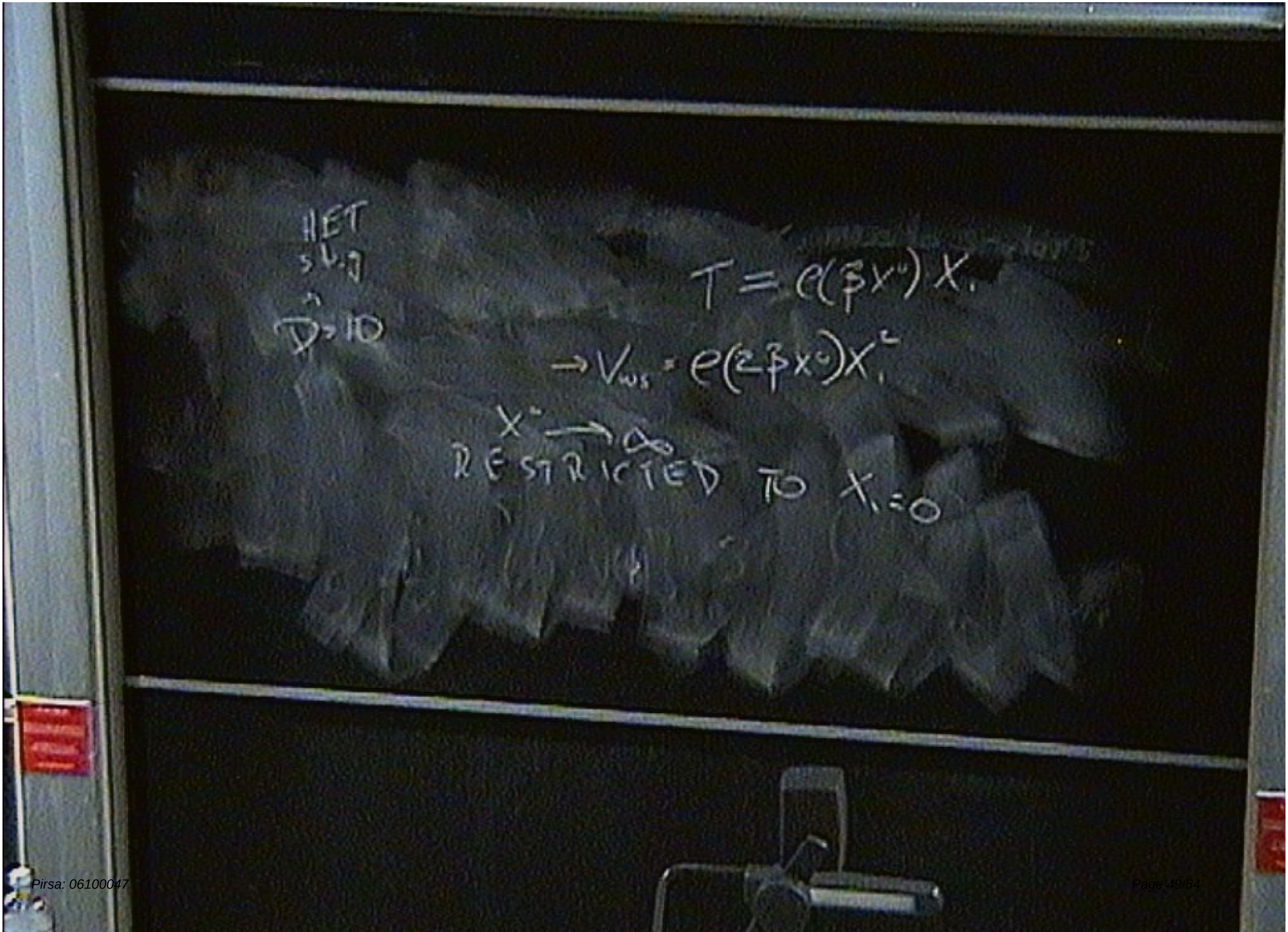
$T e(+\hat{T})$ grows with time

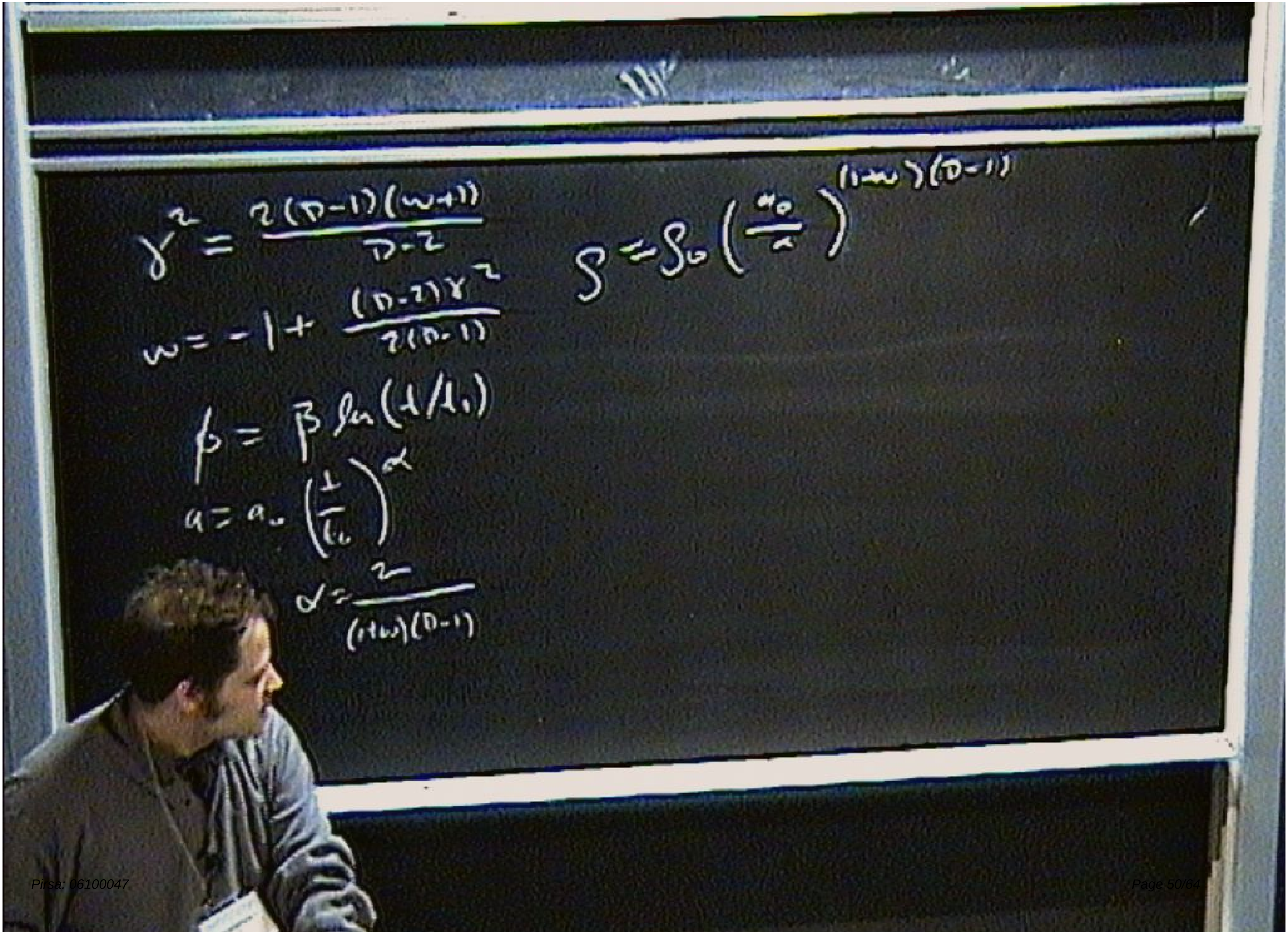
DESTROY SPACE

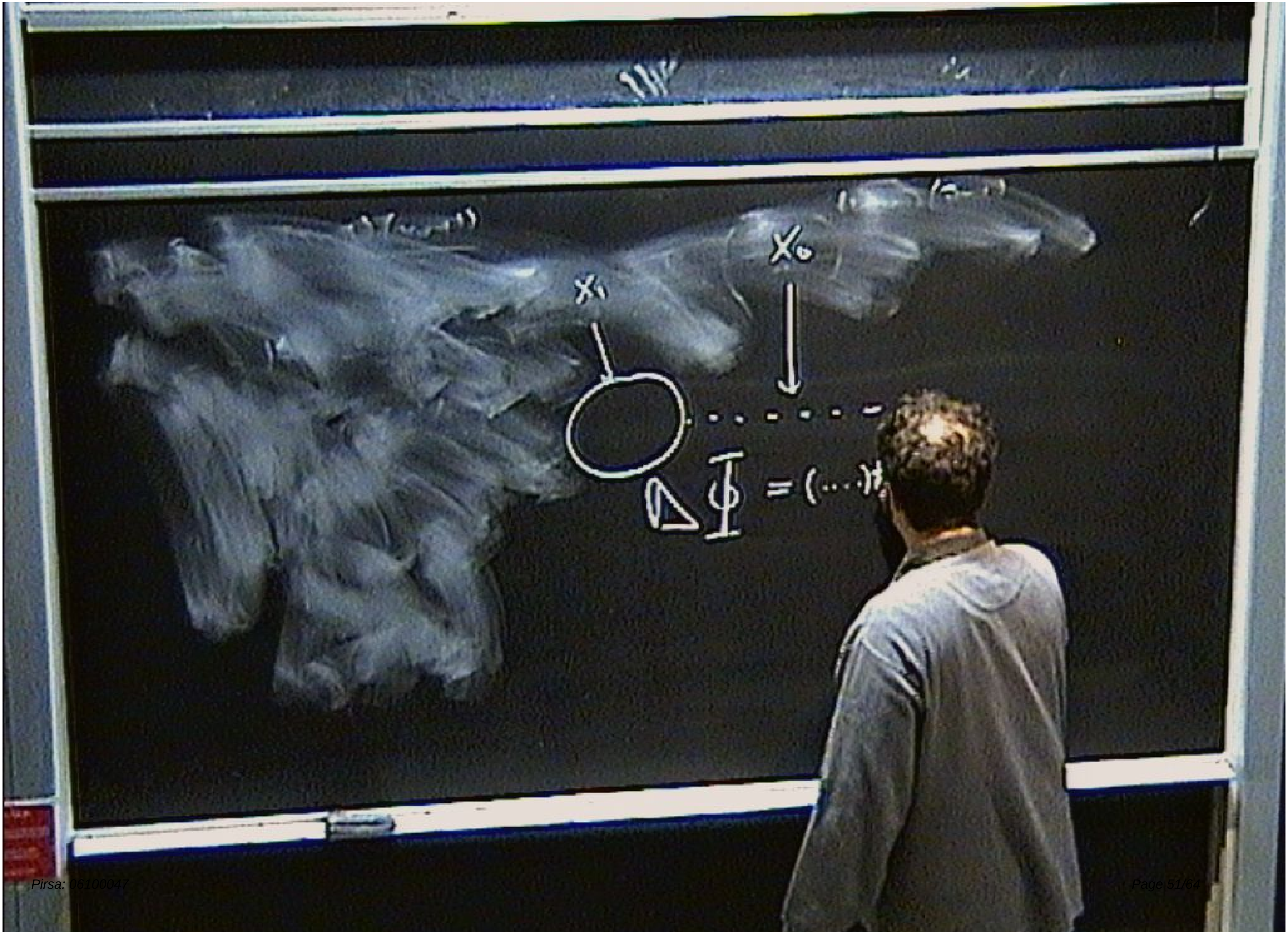
REDUCE #dim's dynamically
other

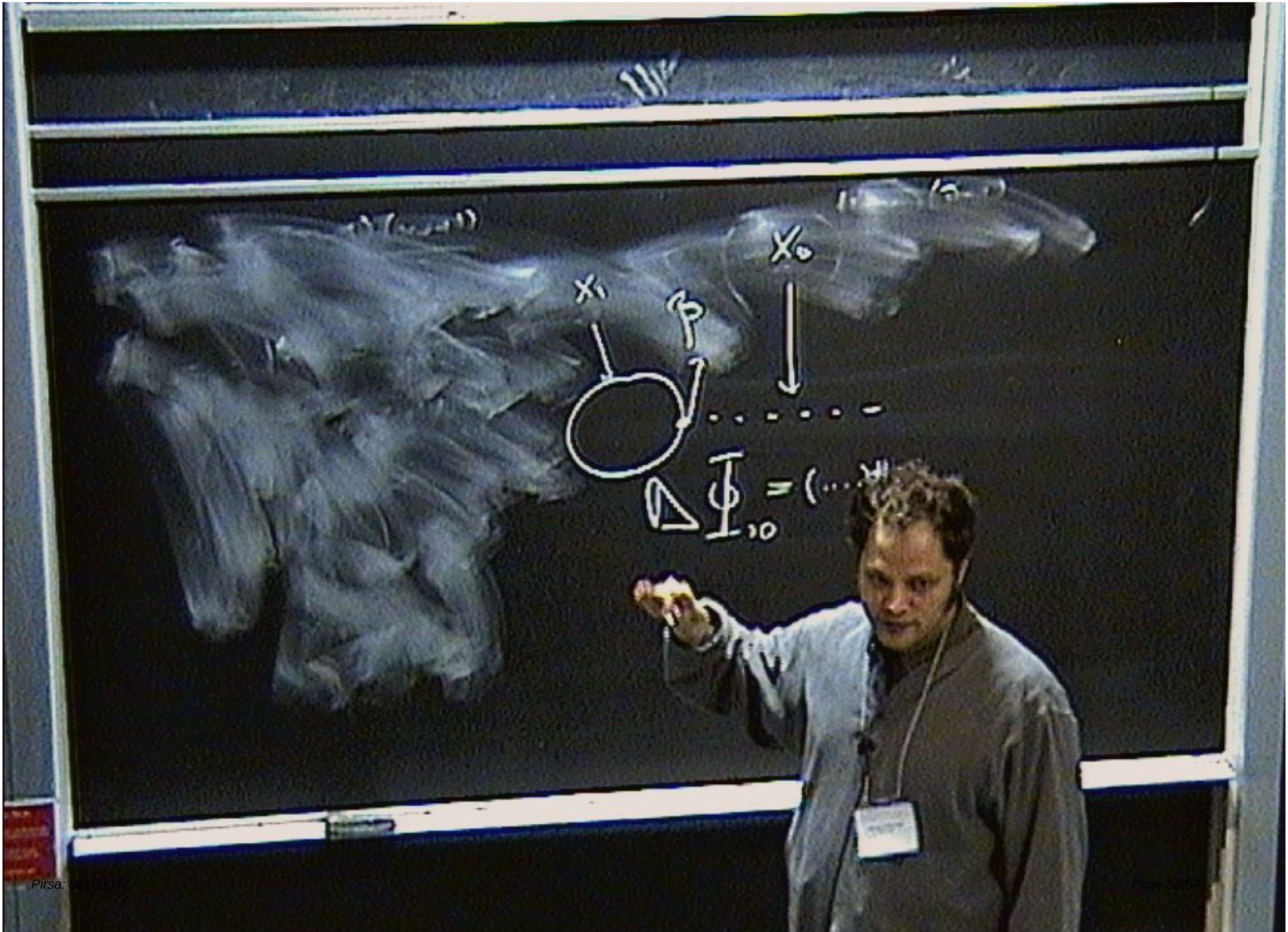

HET
s.b.g
D>10
T = f(βx^μ) X,

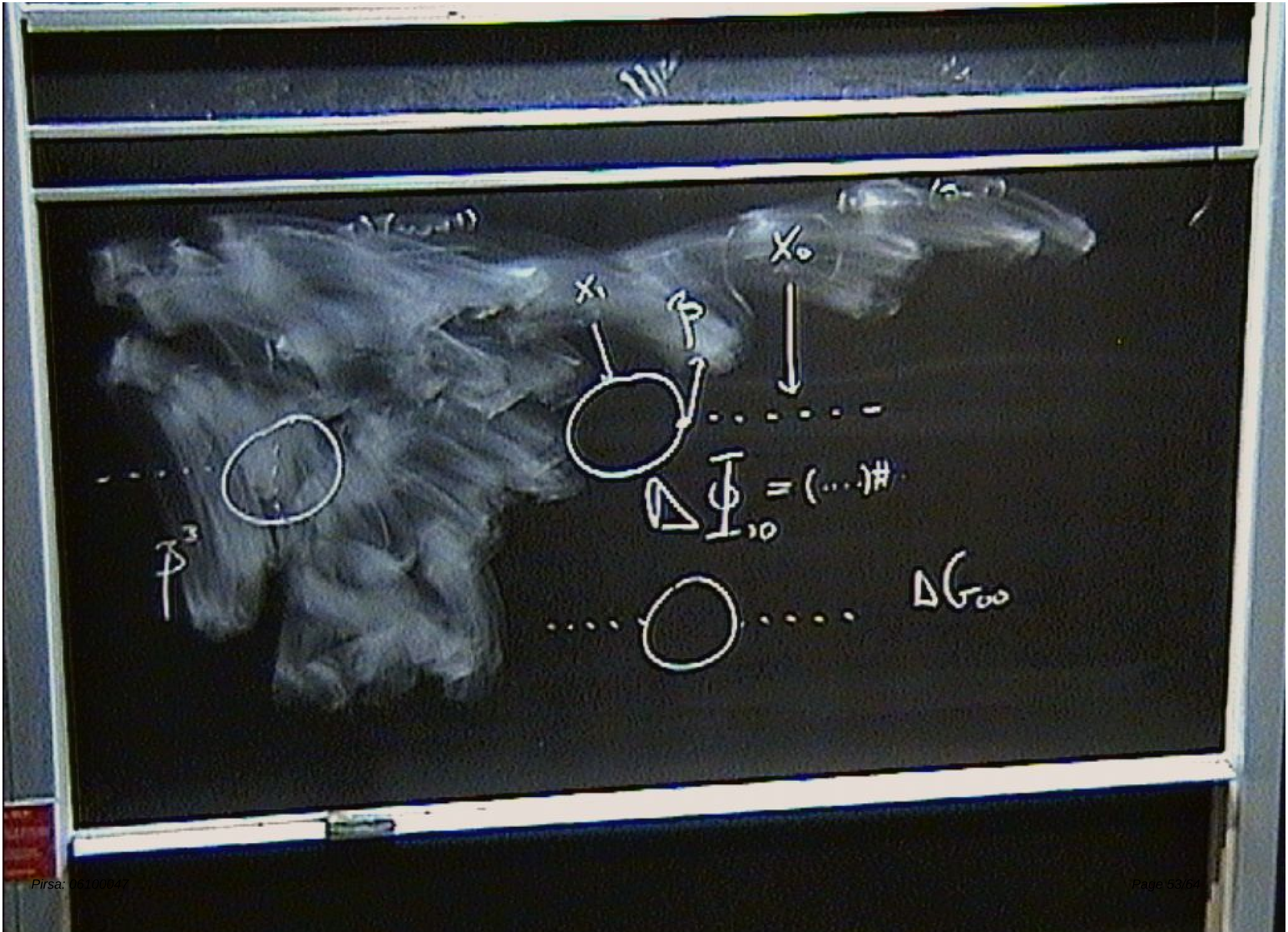

HET
$D>10$
$T = e(\beta X^0)\, X_1$
$\rightarrow V_{ws} = e(2\beta X^0)\, X_1^2$

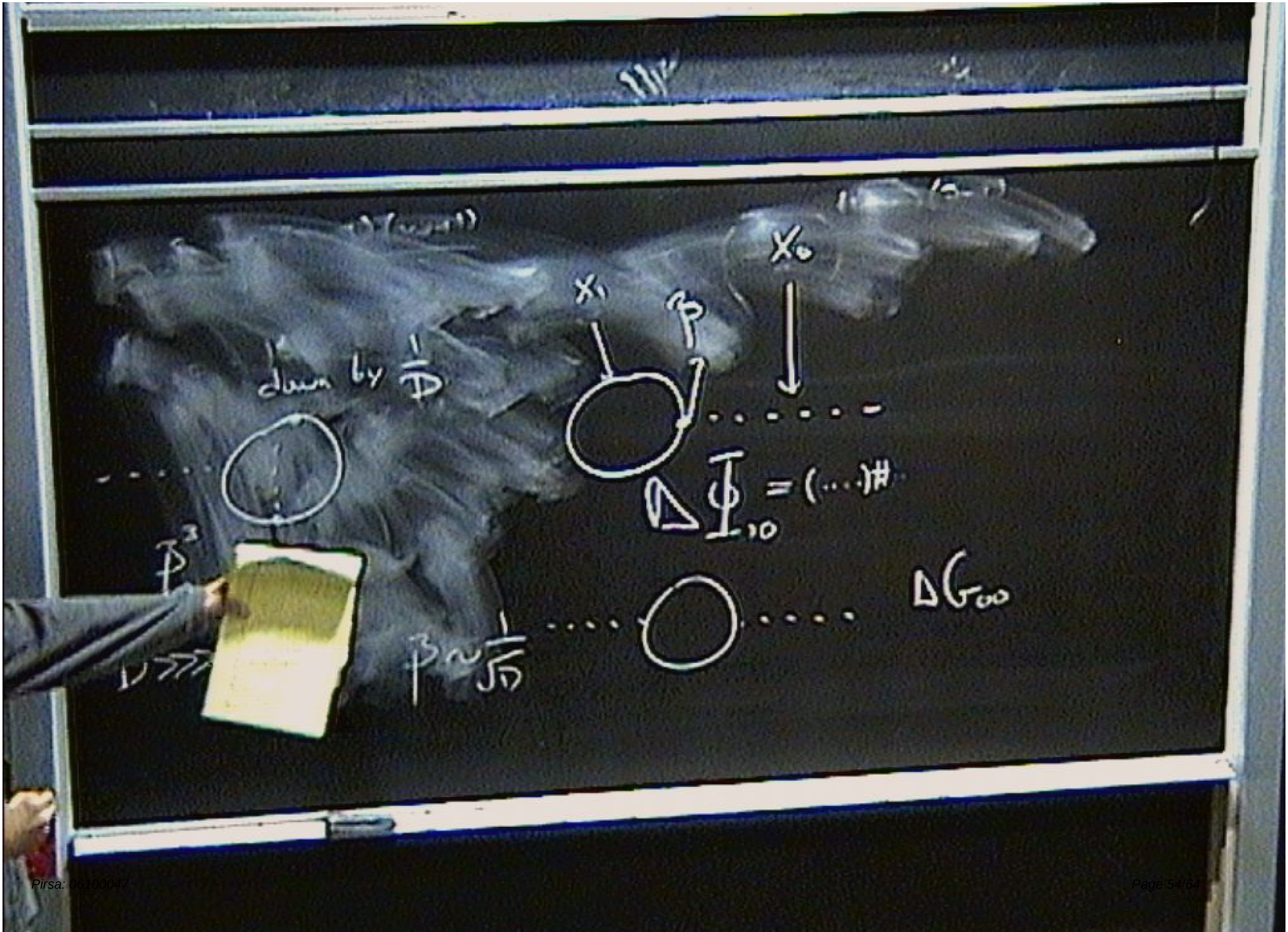

HET
SU.9
$\hat{D} > 10$
$T = e(\beta X^u) X_1$
$\rightarrow V_{WS} = e(2\beta X^u) X_1^2$
$X^u \longrightarrow \infty$
RESTRICTED TO $X_1 = 0$


$\gamma^2 = \frac{2(D-1)(w+1)}{D-2}$
$w = -1 + \frac{(D-2)\gamma^2}{2(D-1)}$
$\phi = \beta \ln(t/t_0)$
$a = a_0 \left(\frac{t}{t_0}\right)^\alpha$
$\alpha = \frac{2}{(1+w)(D-1)}$
$\rho = \rho_0 \left(\frac{a_0}{a}\right)^{(1+w)(D-1)}$


x_1
X_0
$\Delta \Phi = (\dots)$

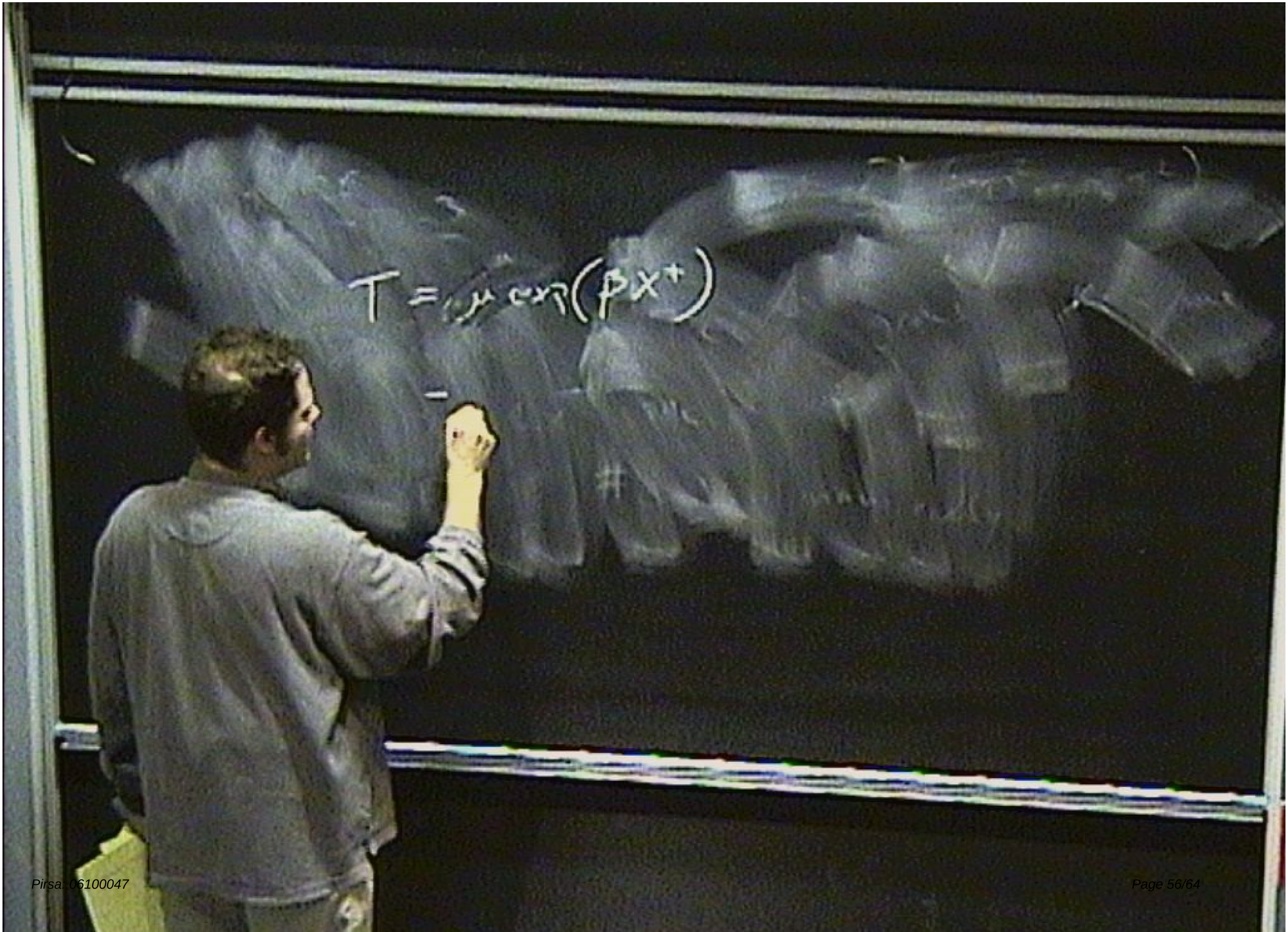

x_1
β
X_0
$\Delta\Phi_{10} = (\ldots$


X₀
x₁
β
ΔΦ₁₀ = (...)#
β³
ΔG₀₀

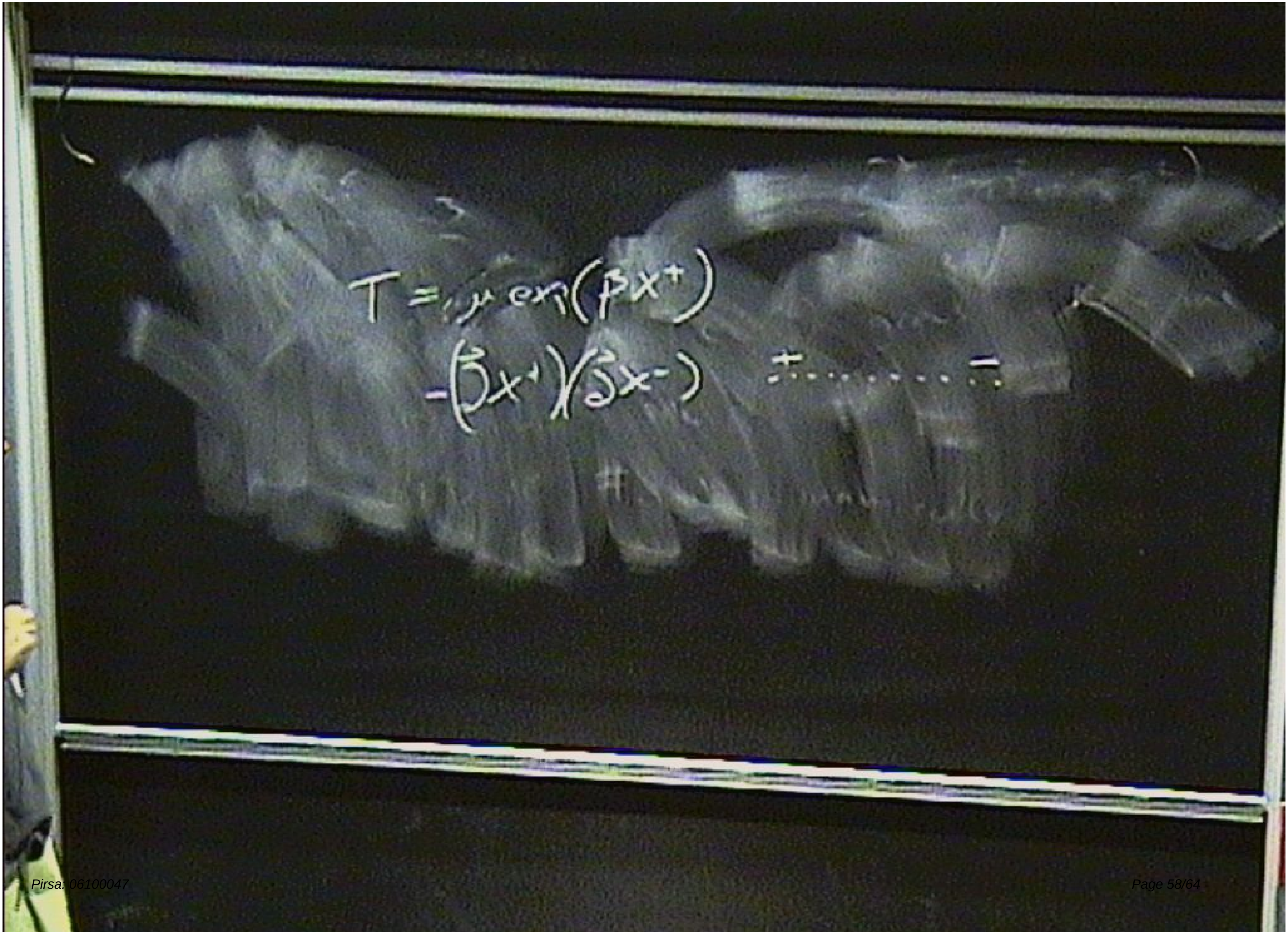


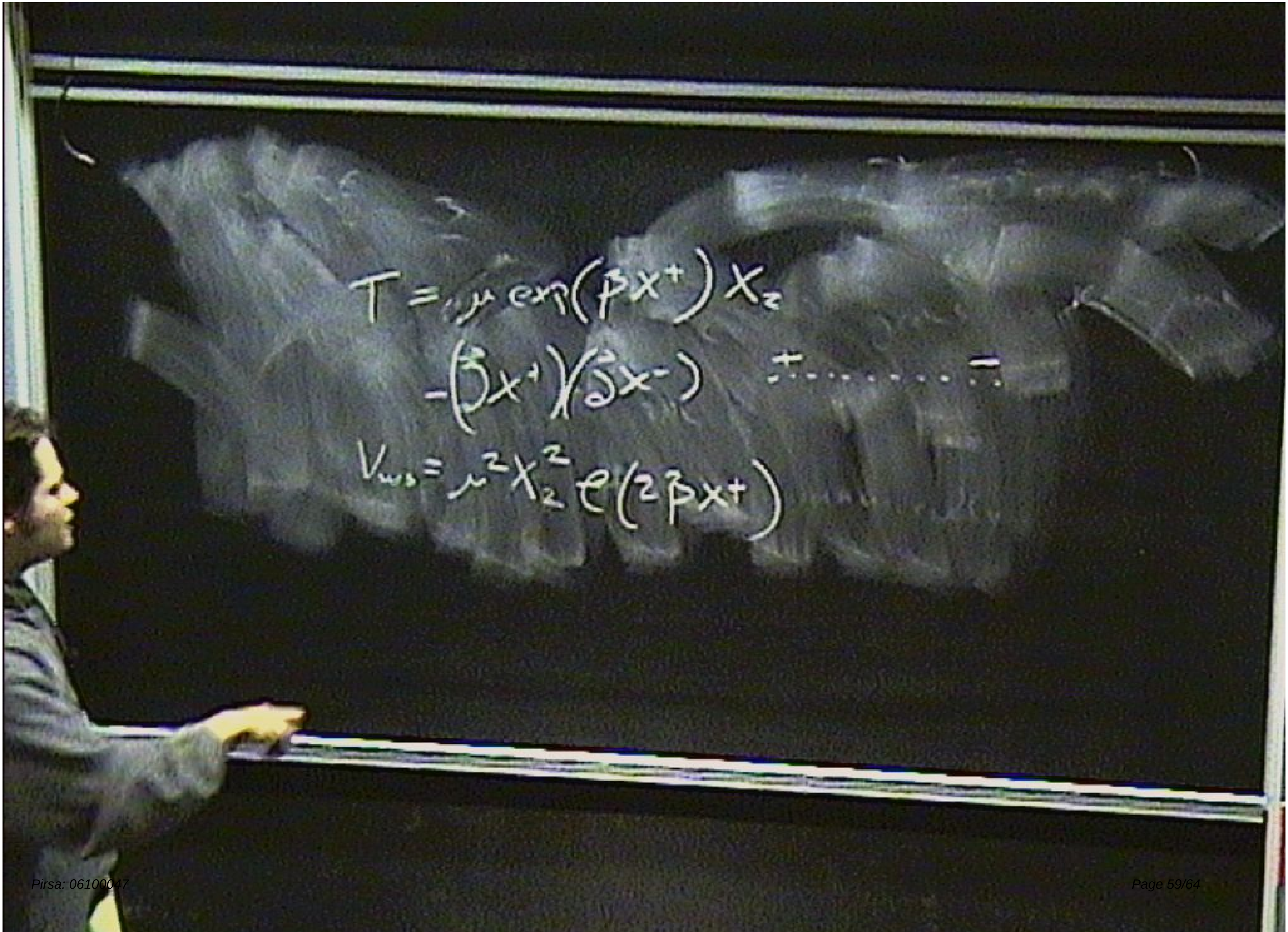
X₀
x₁
β
down by 1/D
ΔΦ₁₀ = (....)#
β³
ΔG₀₀
β ~ 1/√D
D >>>

$\Delta\left(G_{\mu\nu}\,(\nabla\gamma\Phi)^2\right)$ COMPENSATES LOSS TO LEADING O. IN $\frac{1}{D}$


T = μ exp(βx⁺)

$$T = \mu \exp(\beta x^{+}) - (\beta x^{+})(\partial x^{-})$$

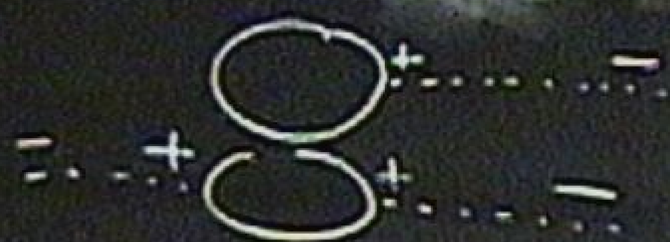

$T = \mu \exp(\beta x^+)$
$-(\beta x^+)(\partial x^-)$

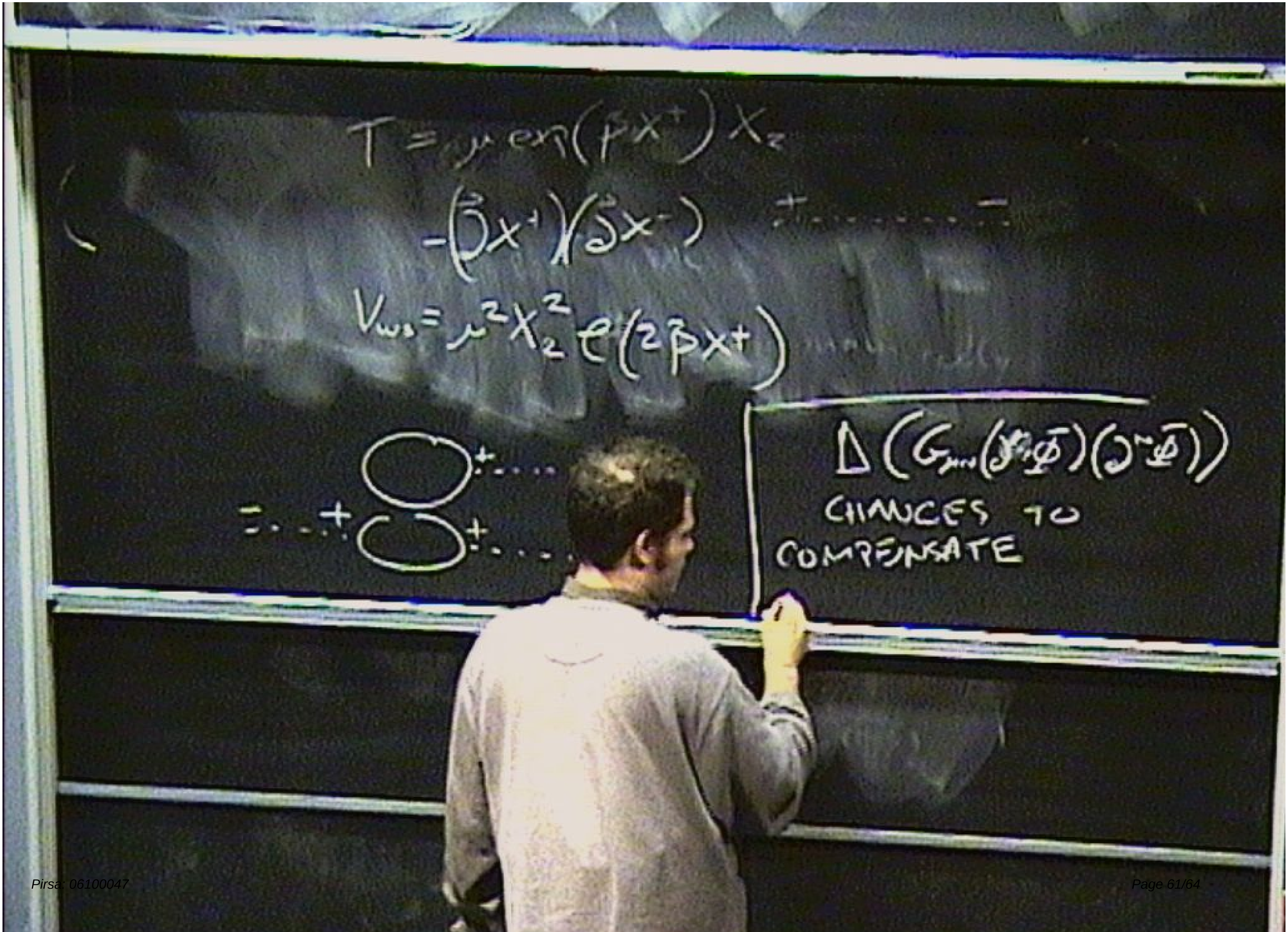

$T = \mu \exp(\beta x^+) X_2$
$-(\beta x^+)(\partial x^-)$
$V_{ws} = \mu^2 X_2^2 e(2\beta x^+)$

$$T = \mu \exp(\beta X^+) X_2$$

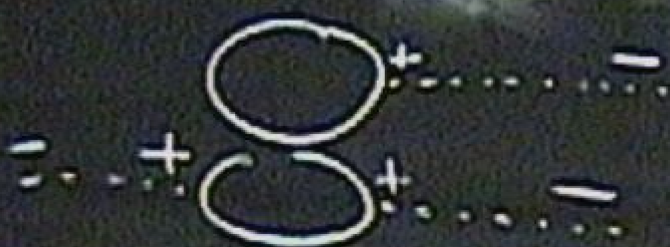
$$-(\beta X^+)(\partial X^-) \qquad + \cdots\cdots - $$

$$V_{ws} = \mu^2 X_2^2 \, e(2\beta X^+)$$




$T = \mu \exp(\beta X^+) X_2$
$-(\partial X^+)(\partial X^-)$
$V_{ws} = \mu^2 X_2^2 e(2\beta X^+)$
$\Delta(G_{\mu\nu}(\partial^\mu \Phi)(\partial^\nu \Phi))$
CHANGES TO
COMPENSATE

$$V_{ws} = \mu^2 X_2^2 \, e^{(2\beta x^+)}$$



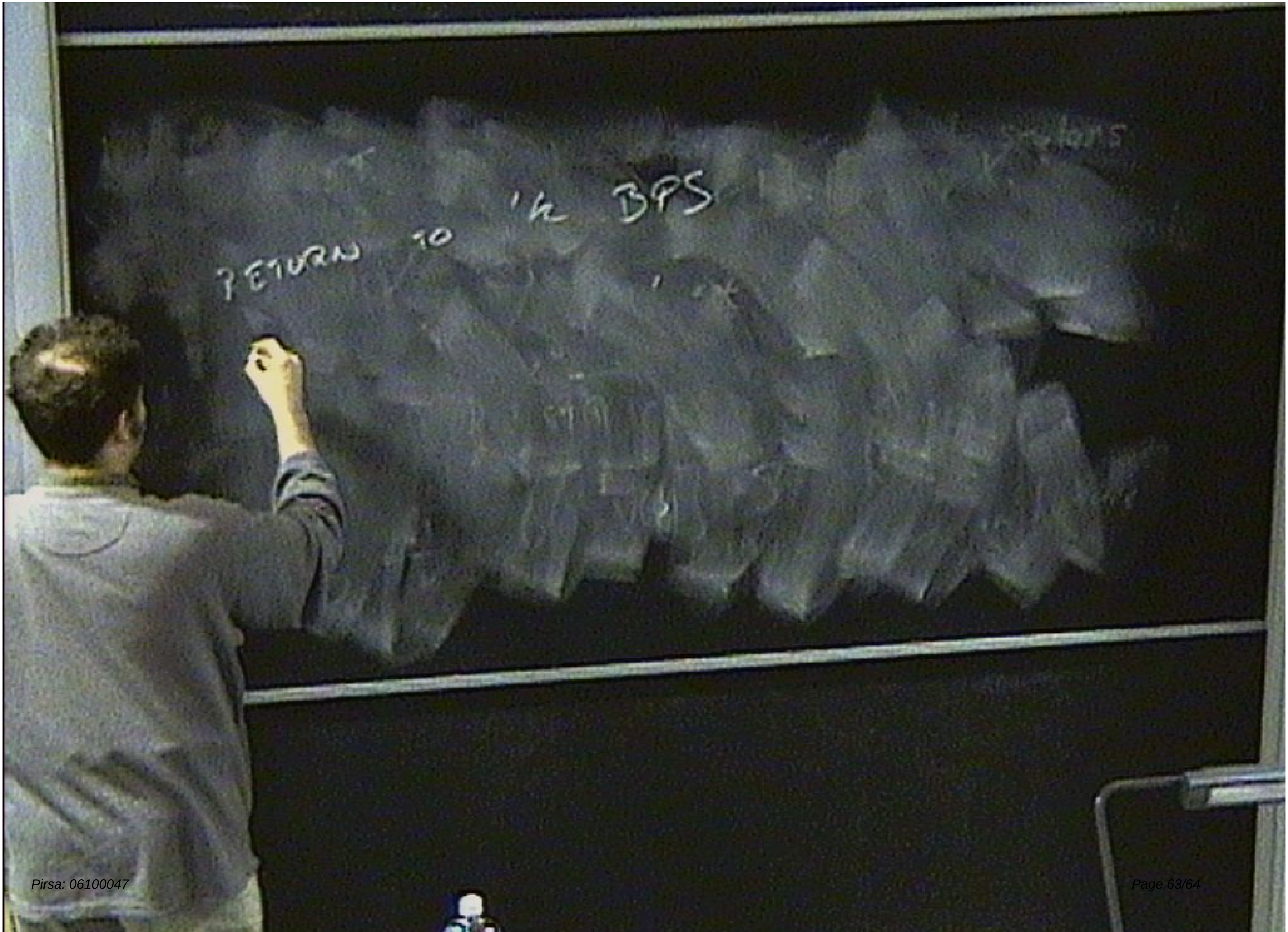
$$\Delta\left(G_{\mu\nu}(\partial^\mu \Phi)(\partial^\nu \Phi)\right)$$

CHANGES TO
COMPENSATE
LOSS OF DIM'N

WINGS
(TIES)

$$e^{(+\sqrt{|m|}-1)t}$$

$$\Gamma \geq \sqrt{|m|}$$


RETURN TO ½ BPS

RETURN TO ½ BPS

SOLVABLE ON SPHERE