Title: PSI - Research Skills 5C

Date: Aug 28, 2009 01:00 PM

URL: http://pirsa.org/09080038

Abstract:

$$\langle \varphi_f | e^{-iHT} | \varphi_i \rangle = \int_{\varphi_i}^{\varphi_f} D\varphi \; e \ldots$$

$$\langle \varphi_f | e^{-HT} | \varphi_i \rangle = \int_{\varphi_i}^{\varphi_f} D\varphi \; e^{-} \ldots$$

$$\langle \varphi_f | e^{-iHT} | \varphi_i \rangle = \int_{\varphi_i}^{\varphi_f} D\varphi \; e$$

$$\langle \varphi_f | e^{-HT_E} | \varphi_i \rangle = \int_{\varphi_i}^{\varphi_f} D\varphi \; e^{-}$$

$$= \int_{\varphi_i}^{\varphi_f} \mathcal{D}\varphi \; e^{iS[\varphi]}$$

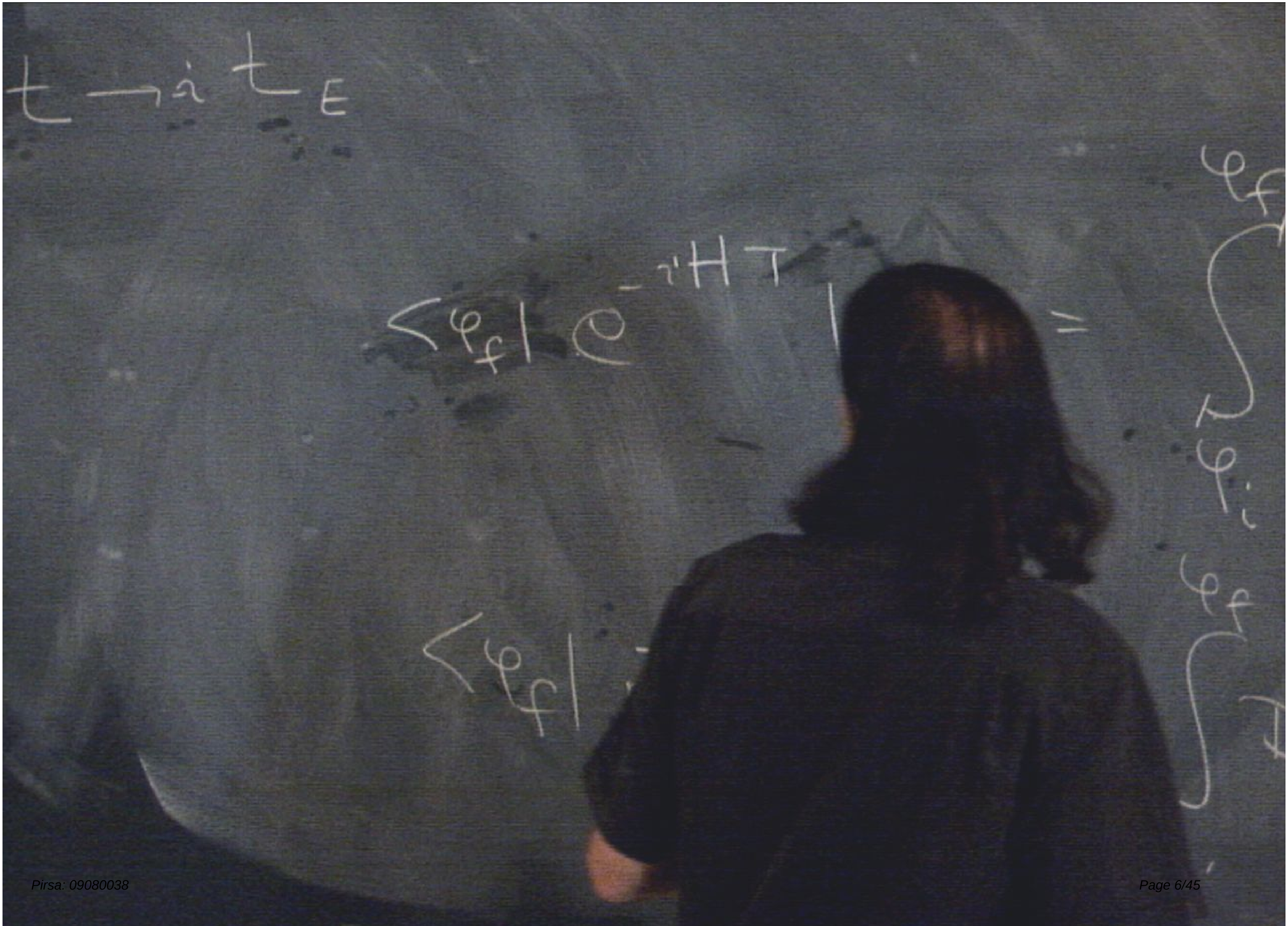
$$= \int_{\varphi_i}^{\varphi_f} \mathcal{D}\varphi \; e^{-S_E[\varphi]}$$

$$S =$$

$S[\varphi]$

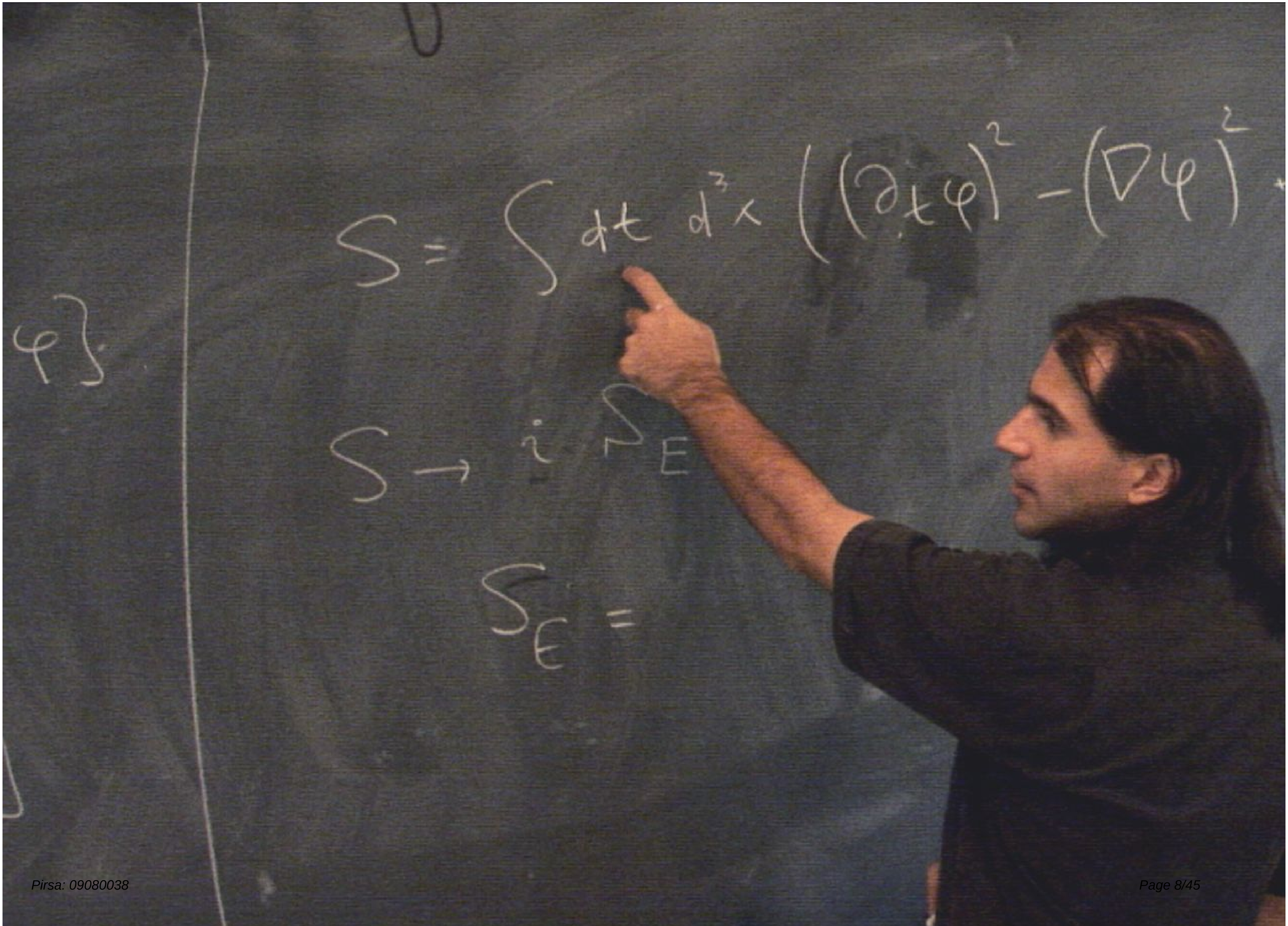
$$S = \int dt\, d^3x\, \mathcal{L}$$

$S_E[\varphi]$


$t \to i t_E$
$\langle \varphi_f | e^{-iHT} | \; =$
φ_f
φ_i
φ_f
$\langle \varphi_f |$

$$S = \int dt\, d^3x\, \mathcal{L}$$

$$S \to i\, S_E$$



$S = \int dt\, d^3x \left((\partial_t \varphi)^2 - (\nabla\varphi)^2 +\right.$
$S \to i\, S_E$
$S_E =$

$$S = \int dt\, d^3x \left((\partial_t \varphi)^2 - (\nabla \varphi)^2 + \dots \right).$$

$$S \to i S_E$$

$$S_E = \int \left[\left(\frac{\partial}{\partial t_E} \varphi \right)^2 + (\nabla \varphi)^2 + \dots \right]$$

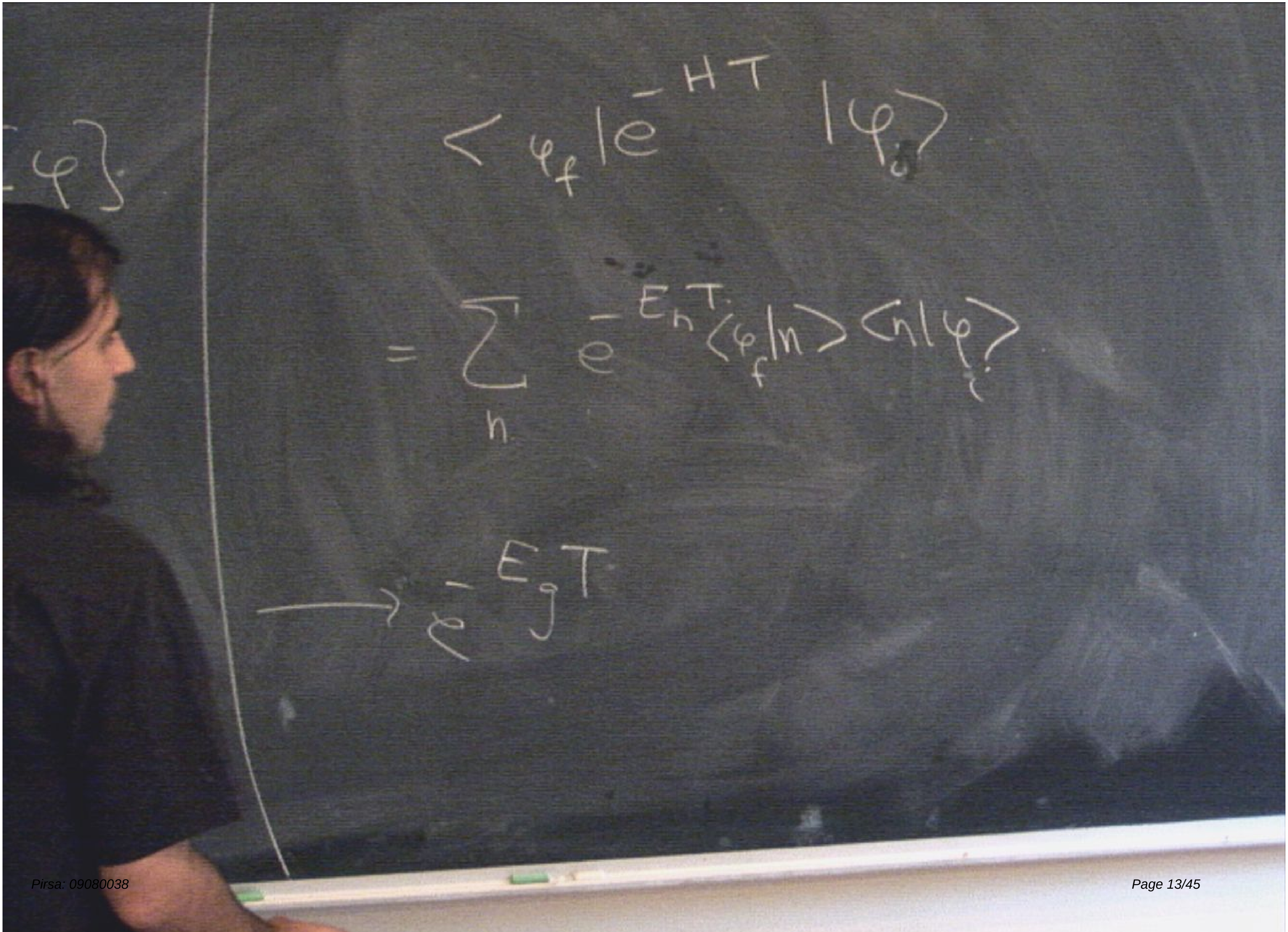
$$e^{-HT}|\varphi\rangle$$

$$e^{-HT}\,|\varphi\rangle$$

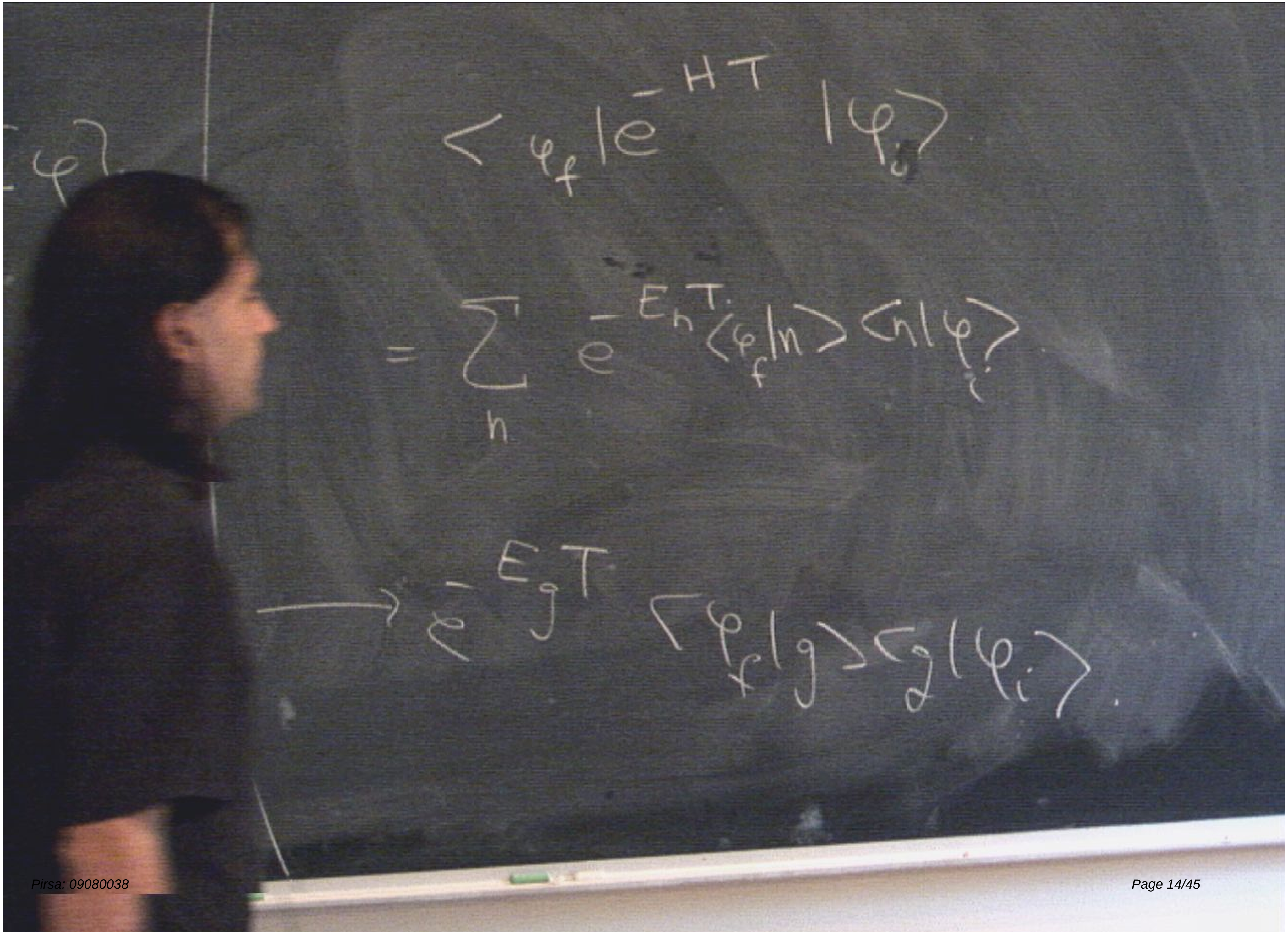
$$= \sum_n e^{-E_n T}\,|n\rangle\langle n|\varphi\rangle$$

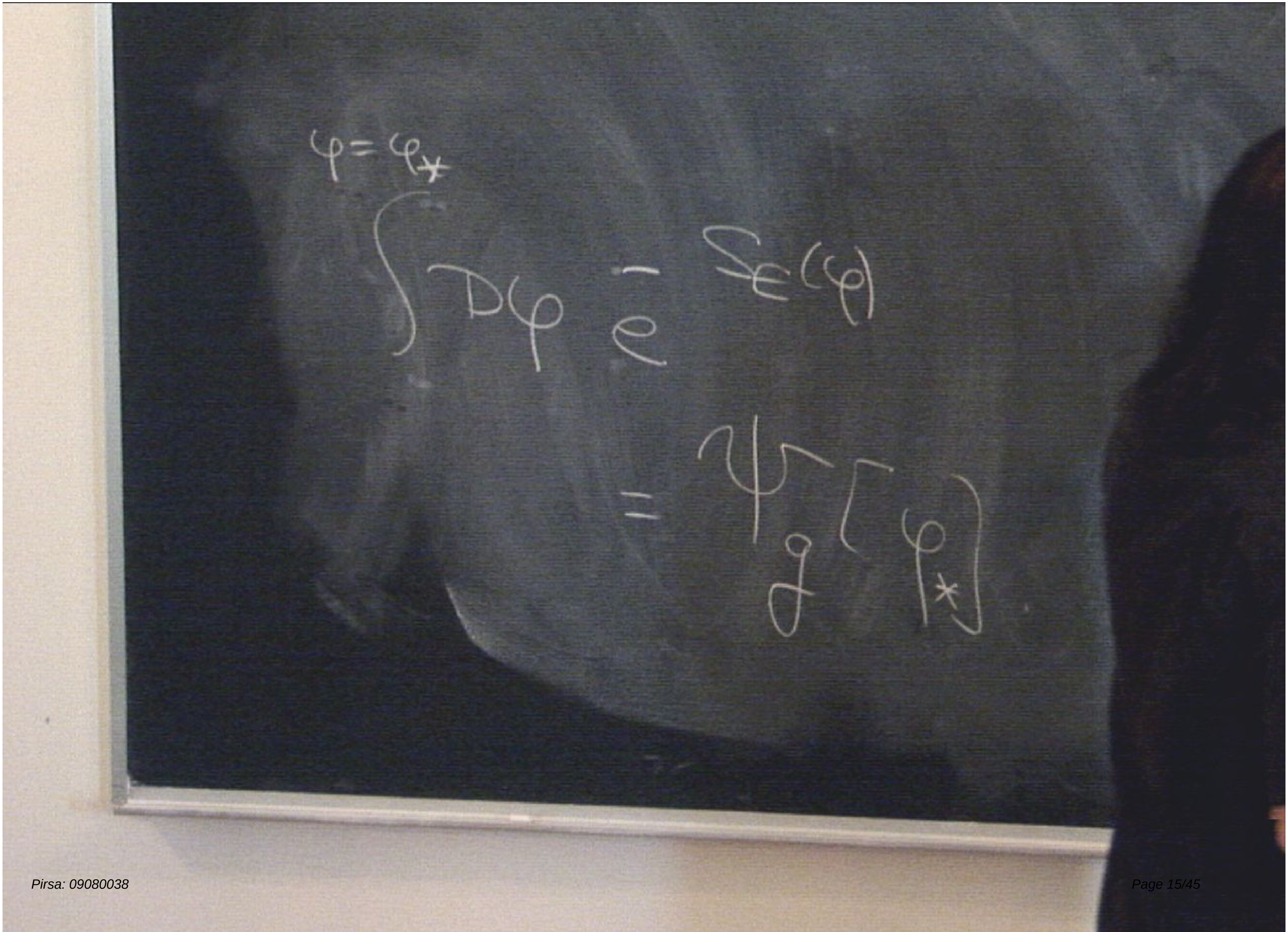
$$\langle \varphi_f | e^{-HT} | \varphi_i \rangle$$

$$= \sum_n e^{-E_n T} \langle \varphi_f | n \rangle \langle n | \varphi \rangle$$

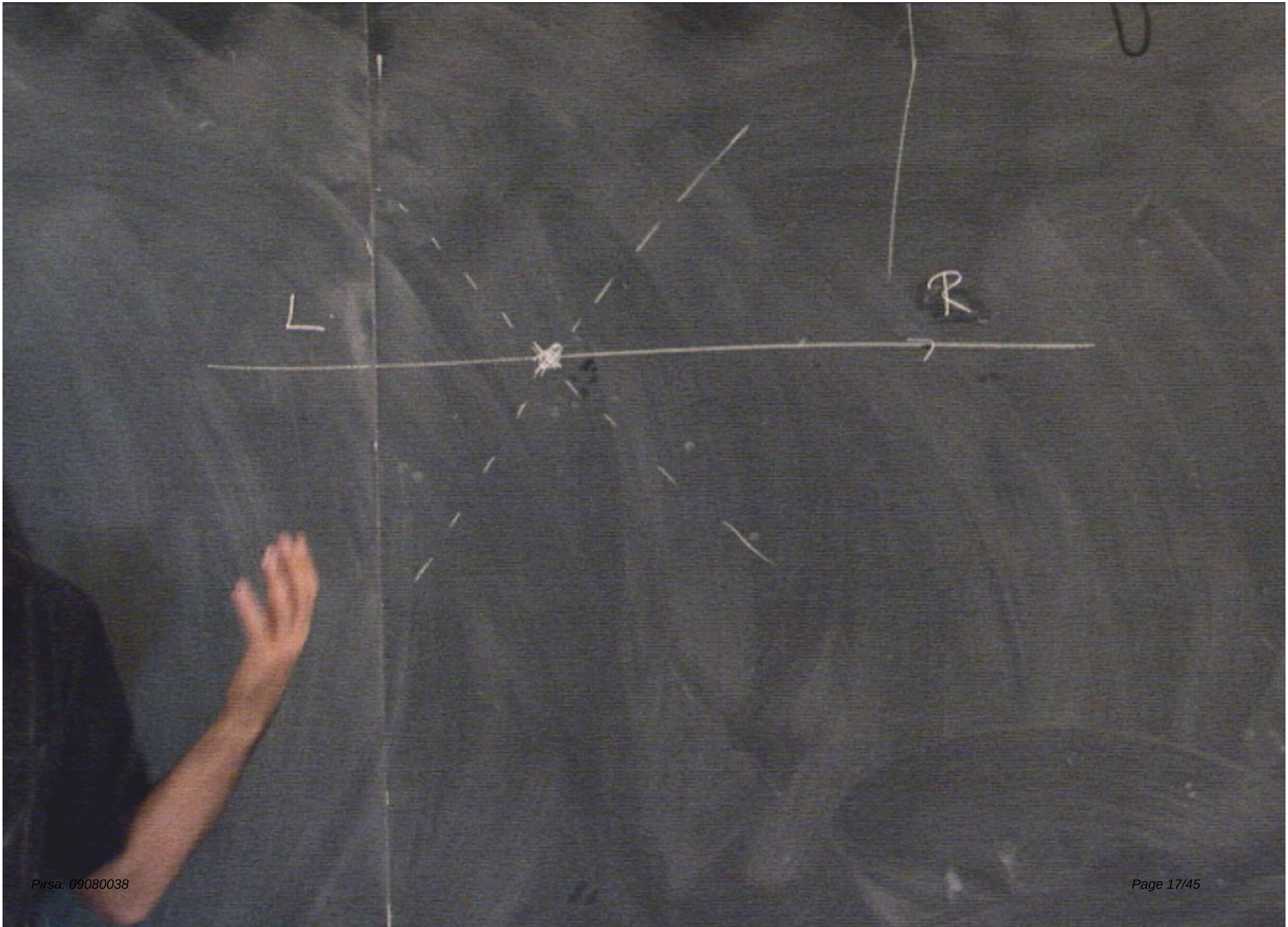


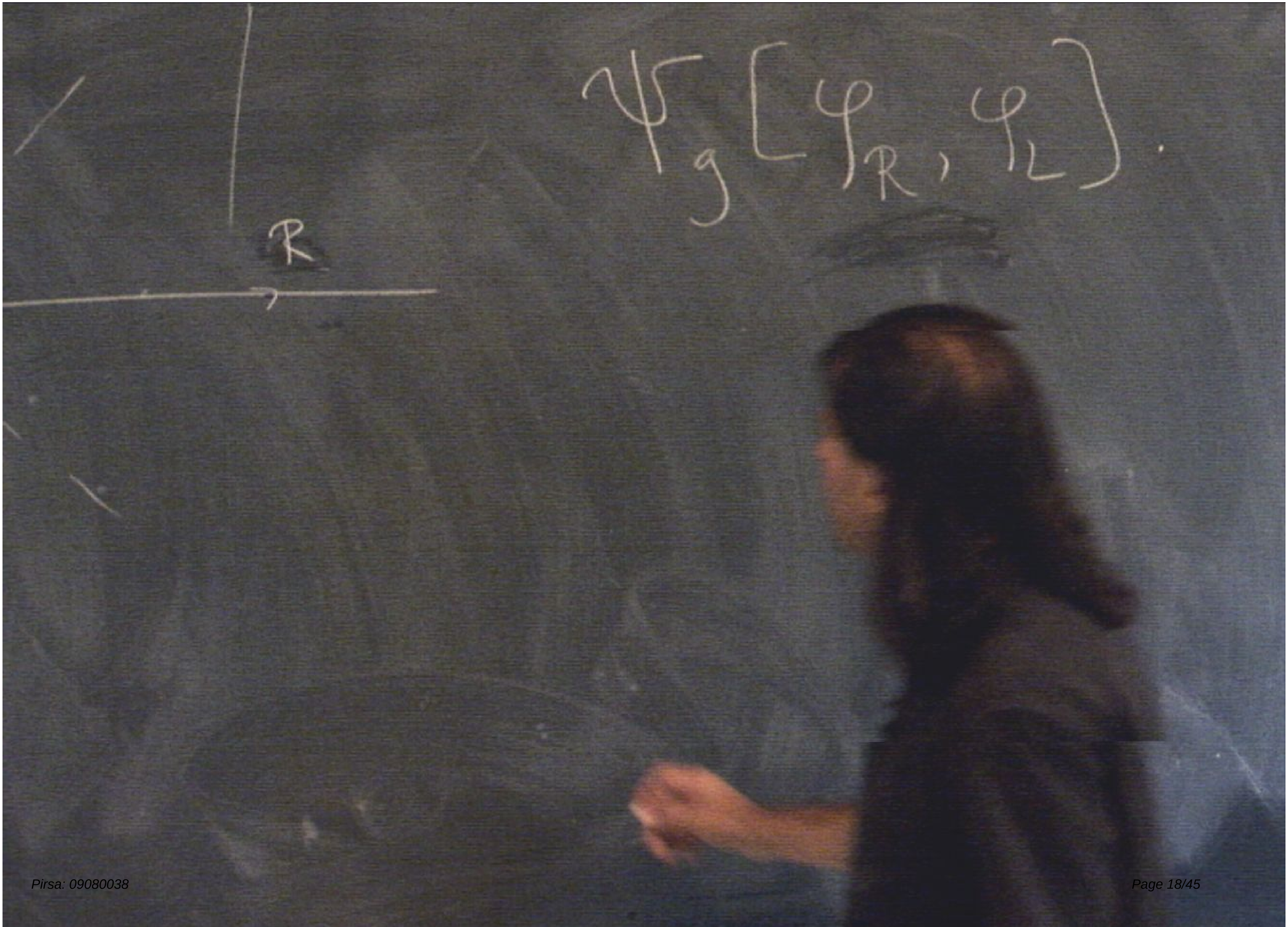
$\langle \varphi_f | e^{-HT} | \varphi_i \rangle$
$= \sum_n e^{-E_n T} \langle \varphi_f | n \rangle \langle n | \varphi_i \rangle$
$\longrightarrow e^{-E_g T}$

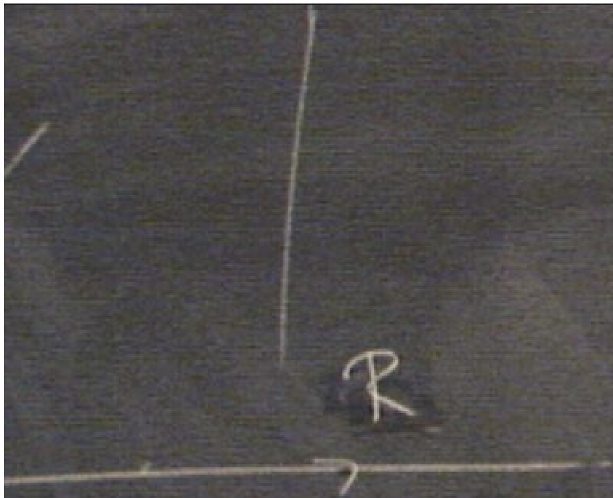

$\langle \varphi_f | e^{-HT} | \varphi_i \rangle$
$= \sum_n e^{-E_n T} \langle \varphi_f | n \rangle \langle n | \varphi_i \rangle$
$\longrightarrow e^{-E_g T} \langle \varphi_f | g \rangle \langle g | \varphi_i \rangle$


$\int^{\varphi=\varphi_*} D\varphi \, e^{-S_E(\varphi)}$
$= \Psi_g[\varphi_*]$


L
R


L
R

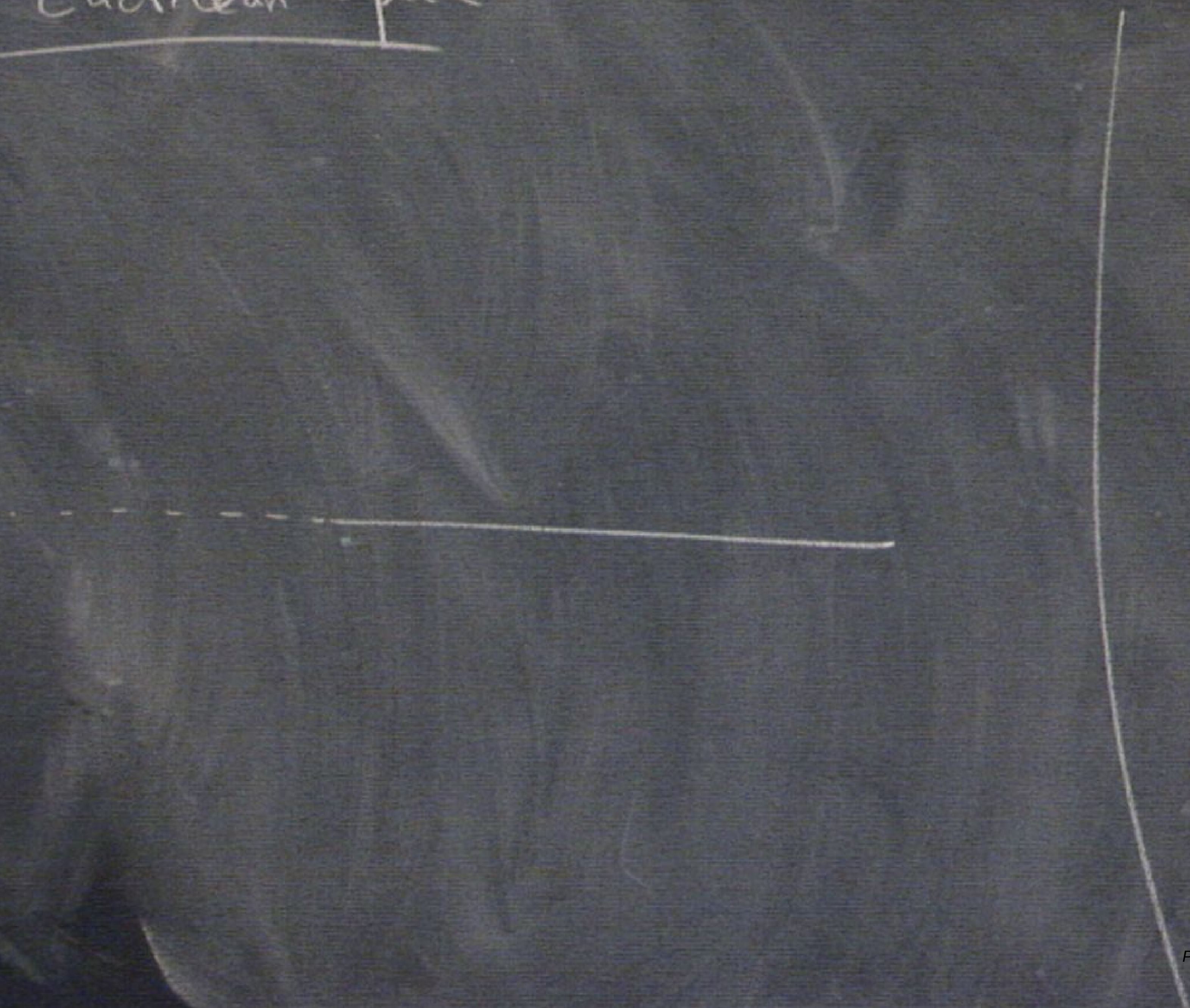

$\Psi_g[\varphi_R, \varphi_L]$.
R

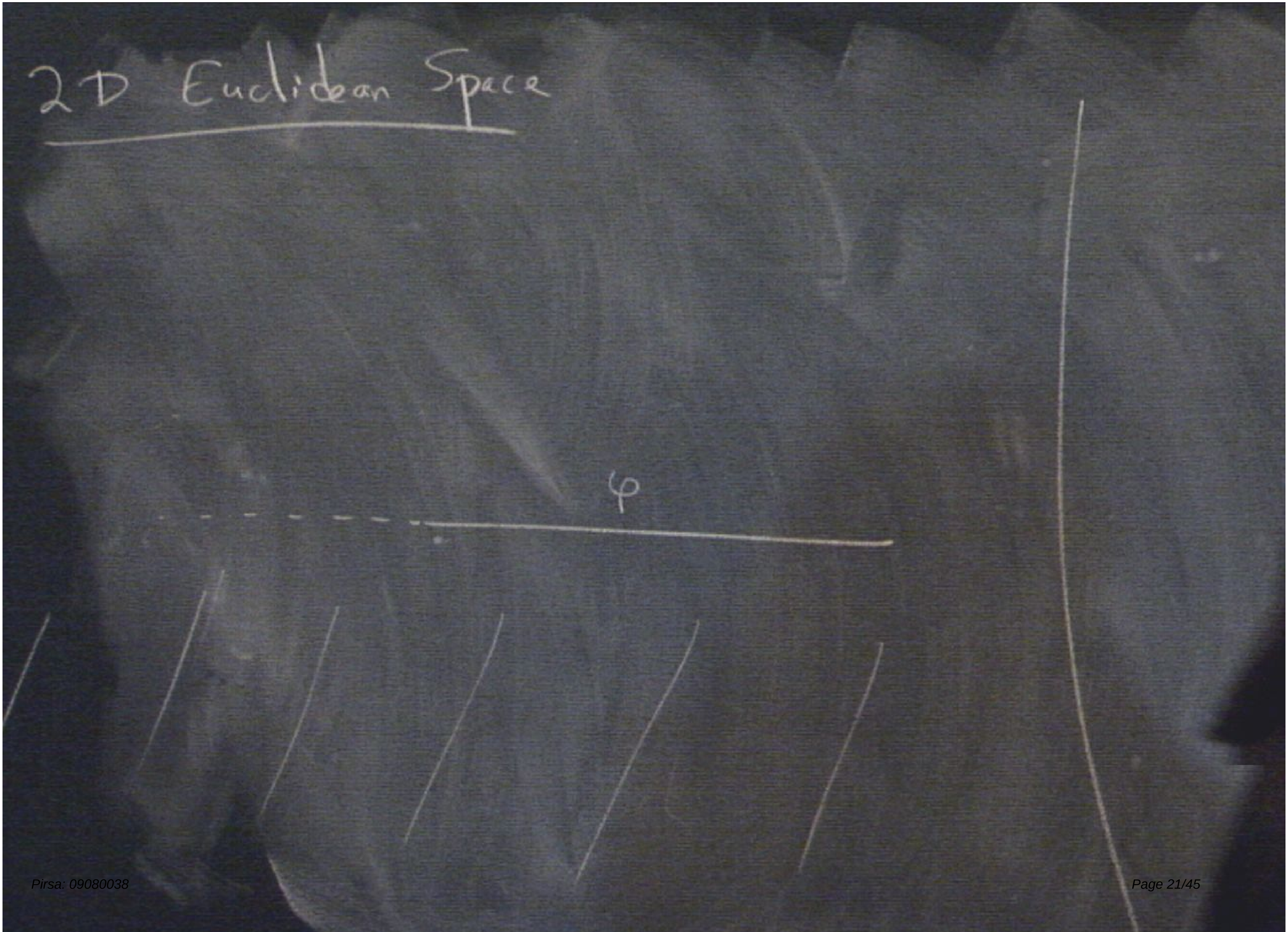


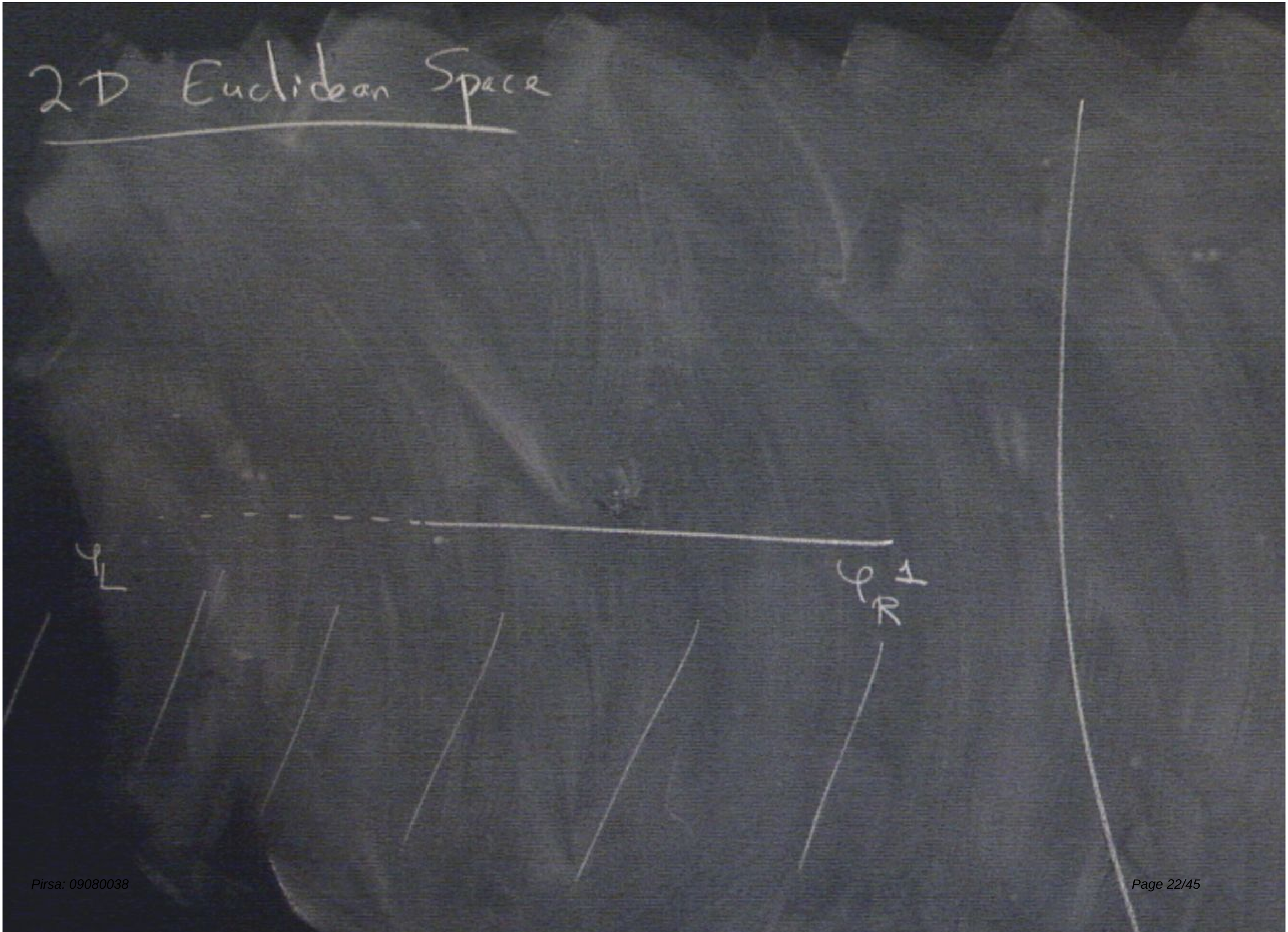
$$\Psi_g[\varphi_R, \varphi_L].$$

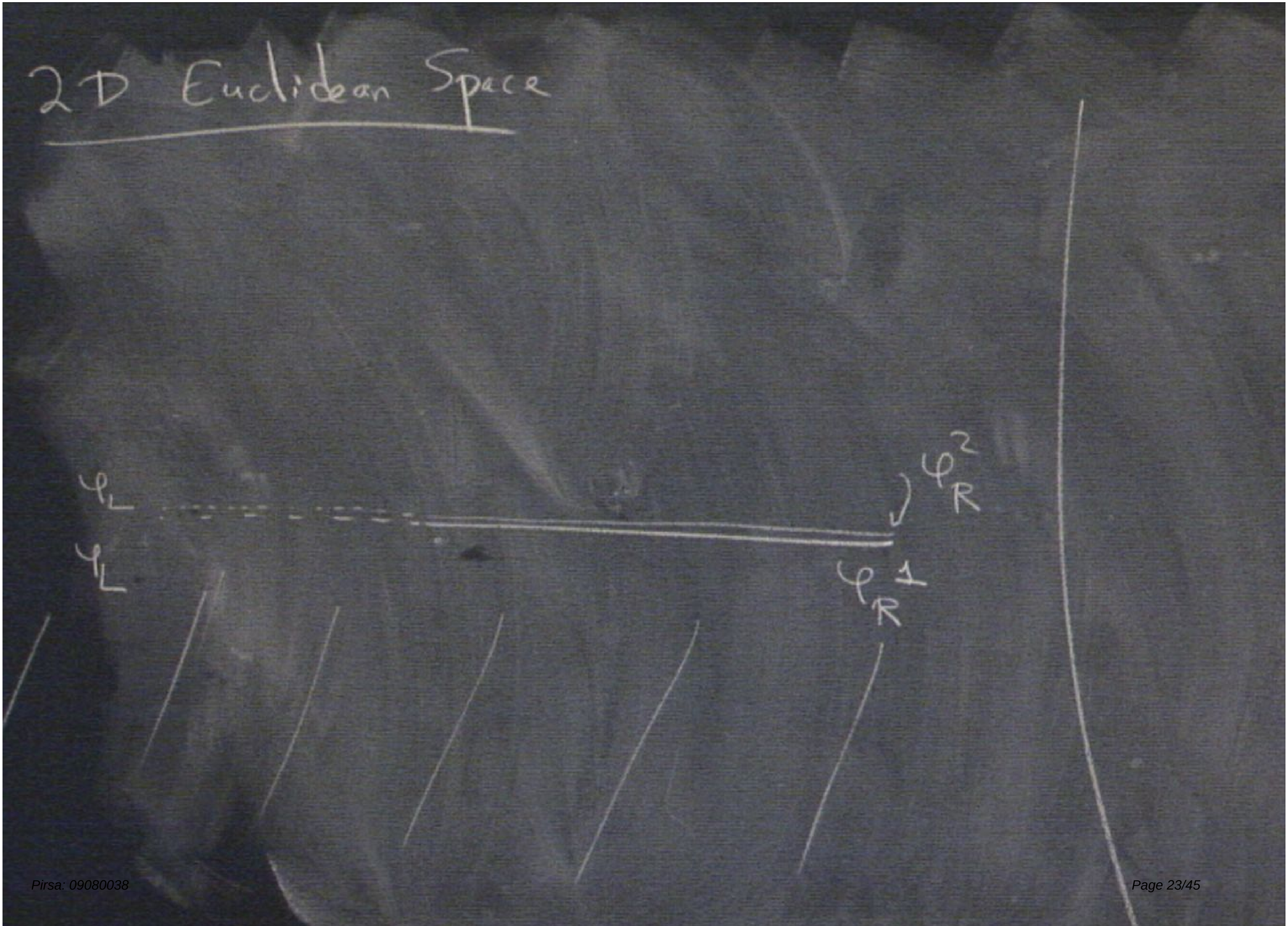
$$\langle \varphi_2^R | \rho^R | \varphi_1^R \rangle = \int D\varphi_L \; \Psi_g^*[\varphi_2^R, \varphi^L] \, \Psi_g[\varphi_1^R, \varphi^L]$$

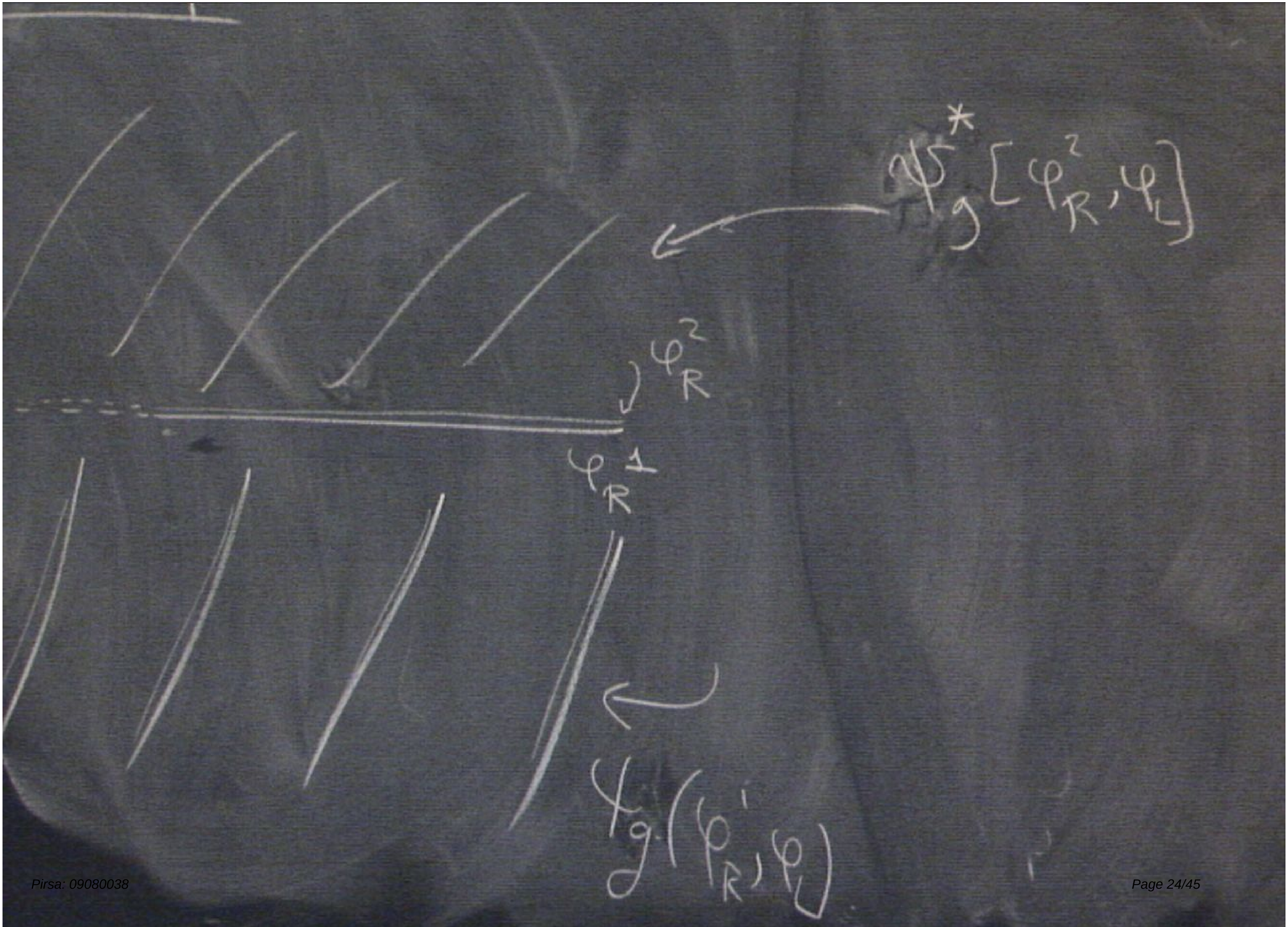
2D Euclidean Space

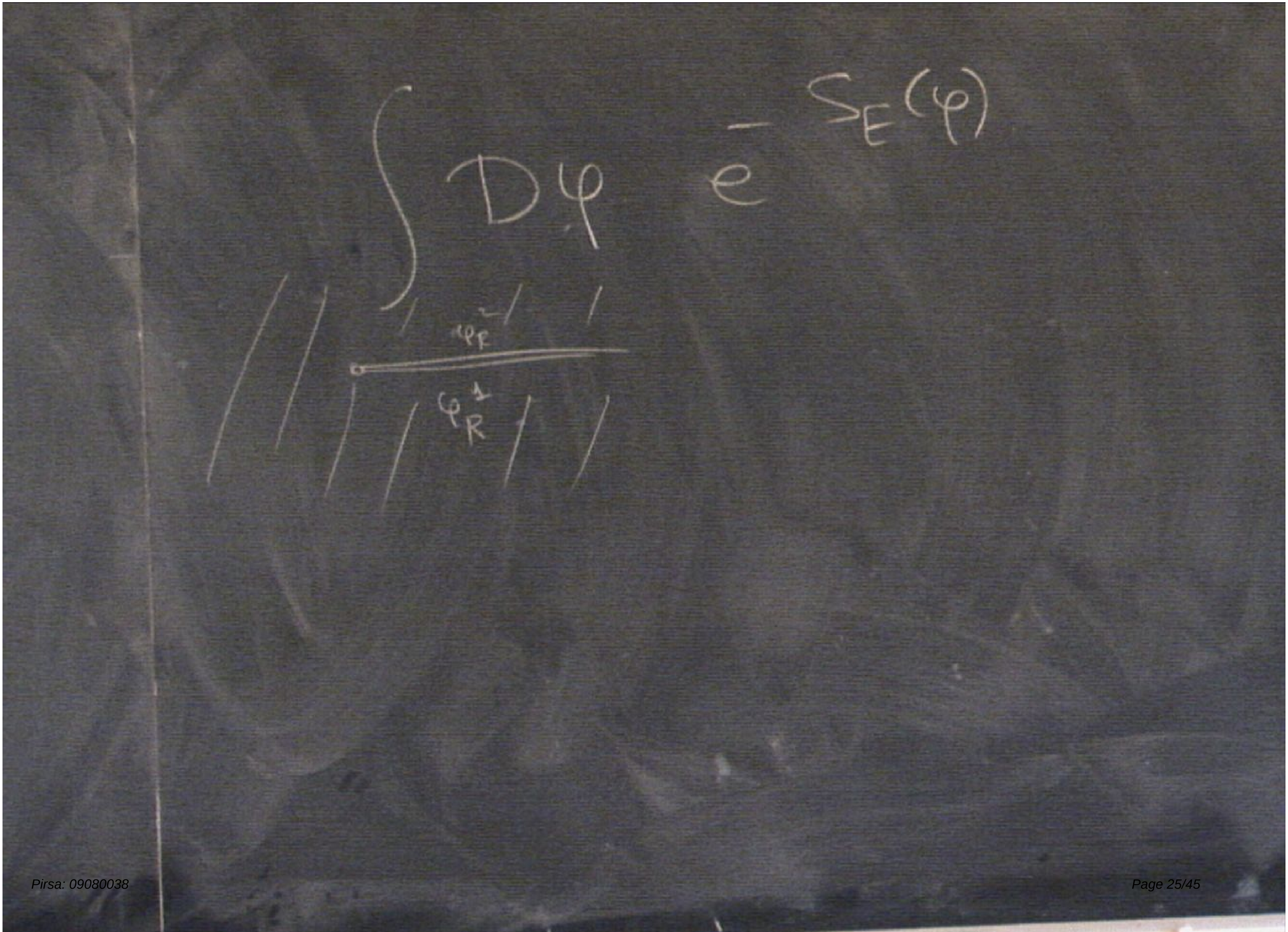


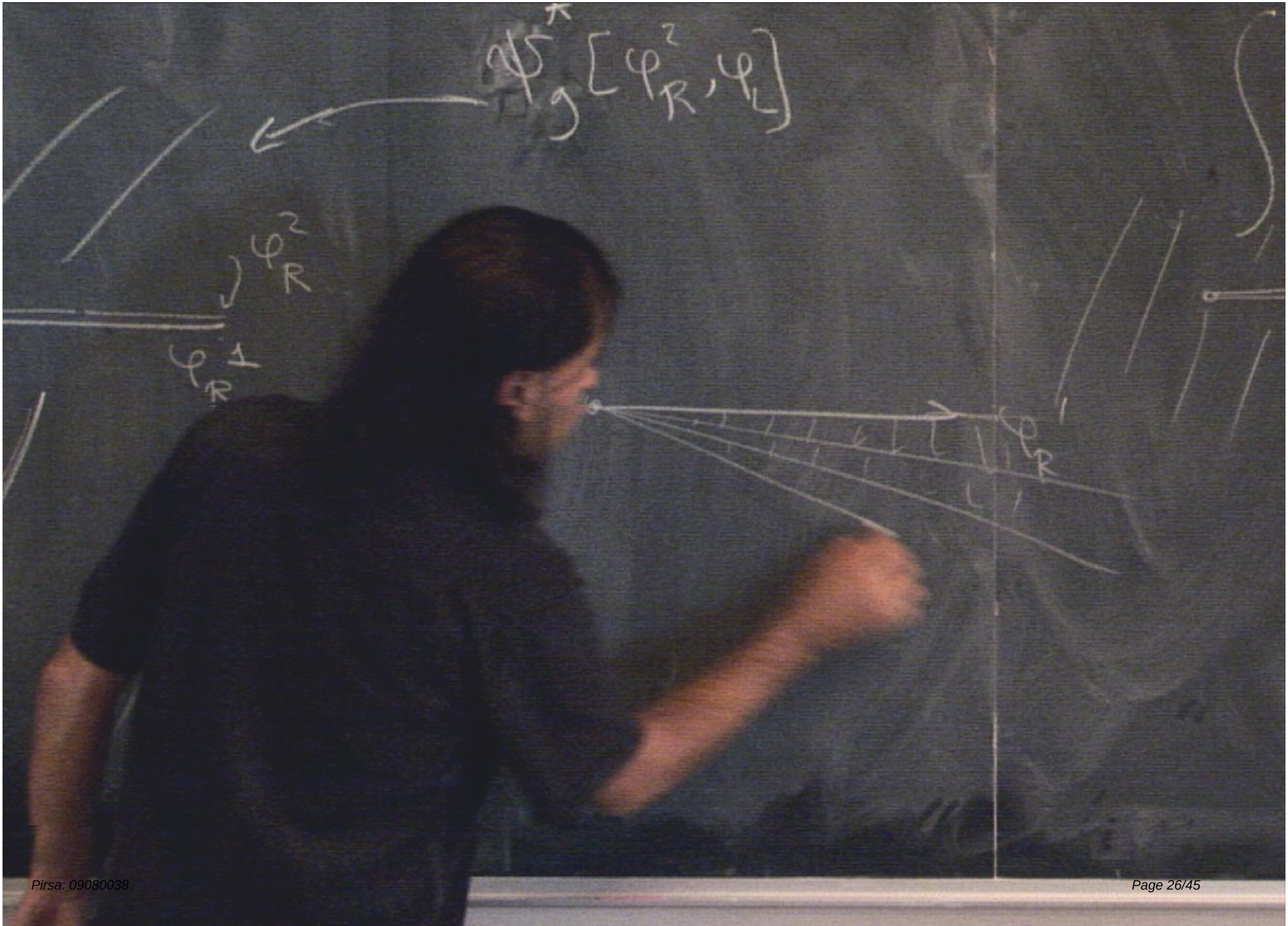

2D Euclidean Space
φ

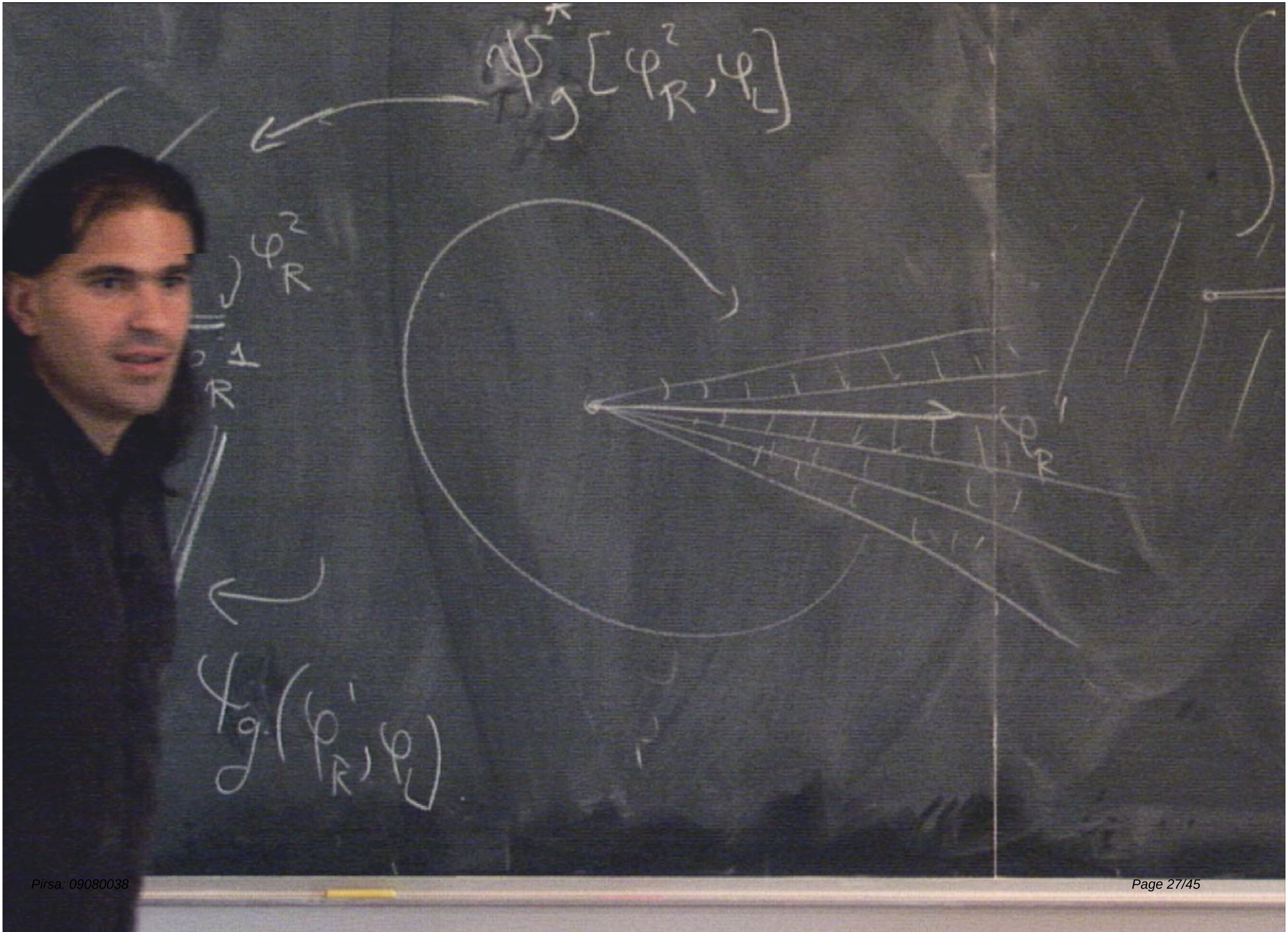

2D Euclidean Space
φ_L
φ_R^1


2D Euclidean Space
φ_L
φ_L
φ_R^2
φ_R^1


$\Psi_g^*[\varphi_R^2, \varphi_L]$
φ_R^2
φ_R^1
$\Psi_g(\varphi_R^1, \varphi_L)$


$\int D\varphi \, e^{-S_E(\varphi)}$
φ_R^2
φ_R^1


$\Psi^*_g[\varphi^2_R, \varphi_L]$
φ^2_R
φ^1_R
φ_R


$\Psi^*_g[\varphi^2_R, \varphi_L]$
φ^2_R
φ^1_R
$\Psi_g(\varphi^1_R, \varphi_L)$

$$\varphi \quad e^{-S_E(\varphi)} \qquad = \langle \varphi_R^2 | e^{-2\pi \mathcal{J}_E} | \varphi_R^1 \rangle$$

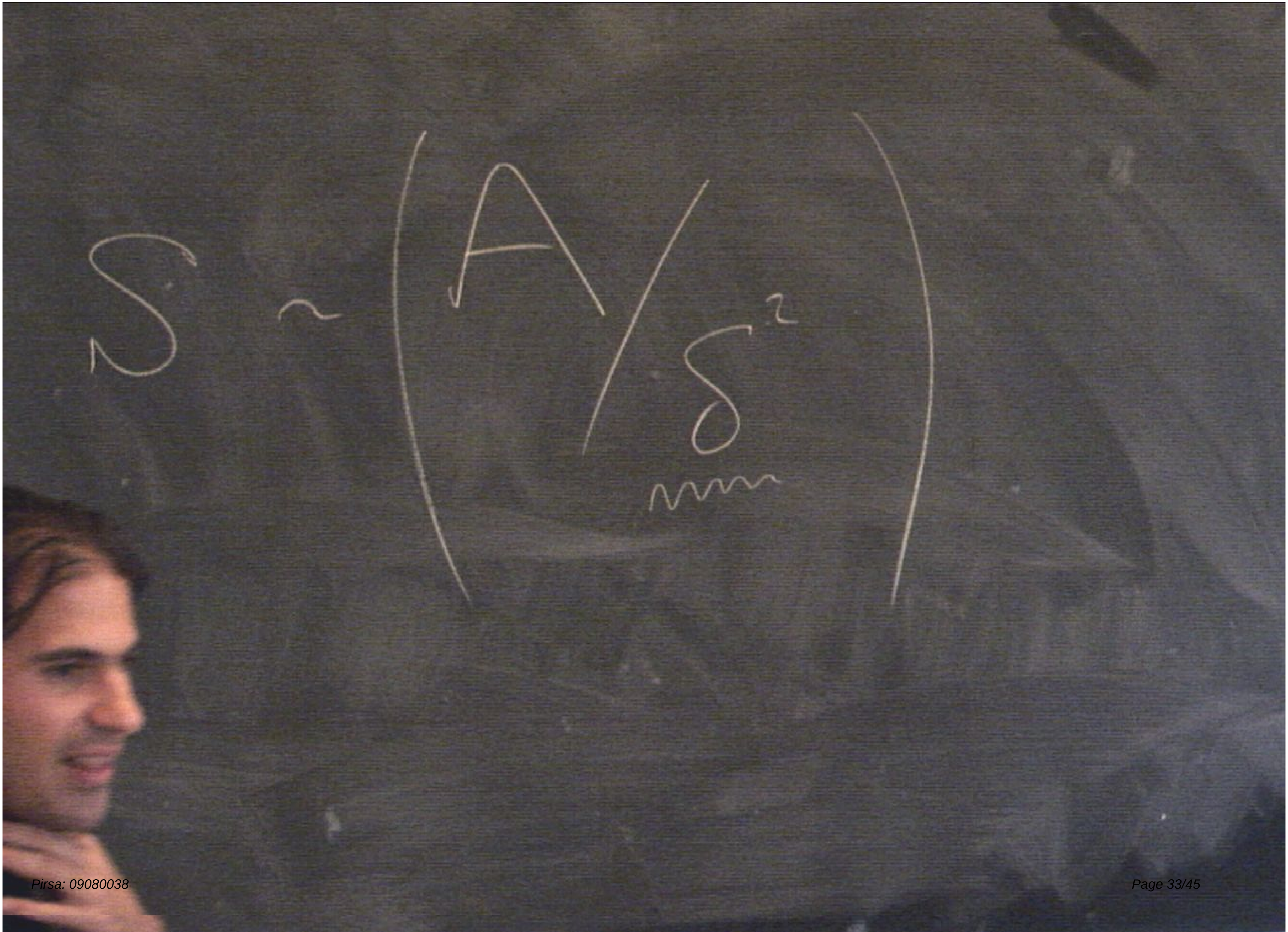
$$\varphi \; e^{-S_E(\varphi)} = \langle \varphi_R^2 | e^{-2\pi \mathcal{J}_E} | \varphi_R^1 \rangle$$

$$= \langle \varphi_R^2 | e^{-2\pi H_R} | \varphi_R^1 \rangle$$


$\epsilon \sim T \sim 1/\epsilon$

$$S \sim \left(A / \delta^{2} \right)$$


Outside
Inside


$S \sim \left(A/\delta^2 \right)$

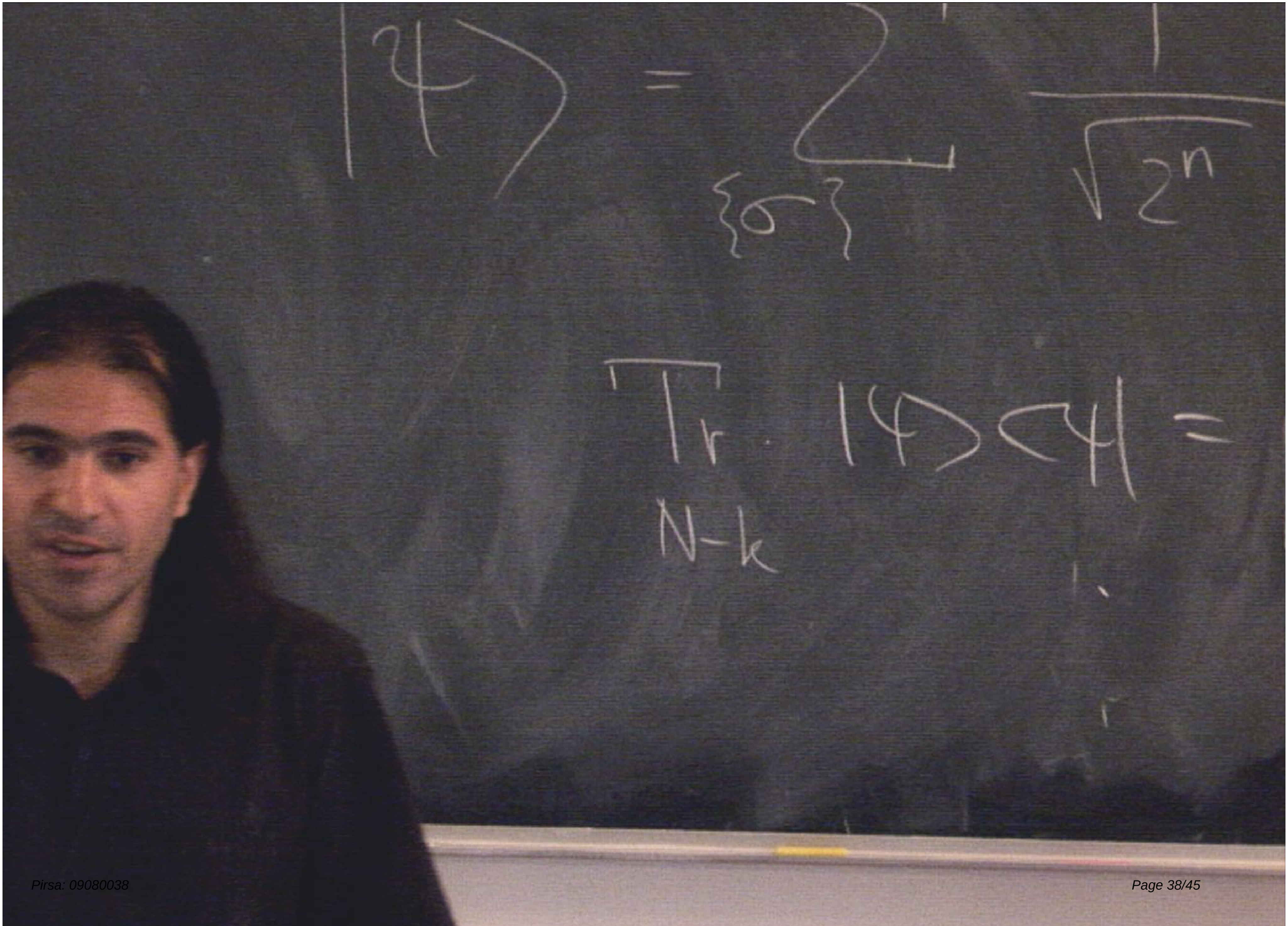
$$S \sim \left(A / \underset{\sim\sim\sim}{\delta^2} \right)$$

$$S^{max} \sim \left(A / \ell_{pl}^2 \right)$$


Outside
Inside

$$|\psi\rangle = \sum \frac{1}{\sqrt{2^n}} \, | \sigma_1, \sigma_2, \ldots, \sigma_n \rangle$$

$$e^{i\Theta(\sigma_1, \ldots, \sigma_n)}$$


$|\psi\rangle = \sum_{\{\sigma\}} \frac{1}{\sqrt{2^n}}$
$\mathrm{Tr}_{N-k} |\psi\rangle\langle\psi| =$

$$|\sigma_1, \sigma_2, \dots, \sigma_n\rangle \; e^{i\theta(\sigma_1, \dots}$$

(k)

$$K \ll N$$

$$k \ll N$$

$$\rho^{(k)} = \frac{1}{2^k} \mathbb{1} + e^{-(N-k)}$$

$e^{+S_{BH}}$

measurements

$|\psi\rangle = \sum_{\{\sigma\}}$

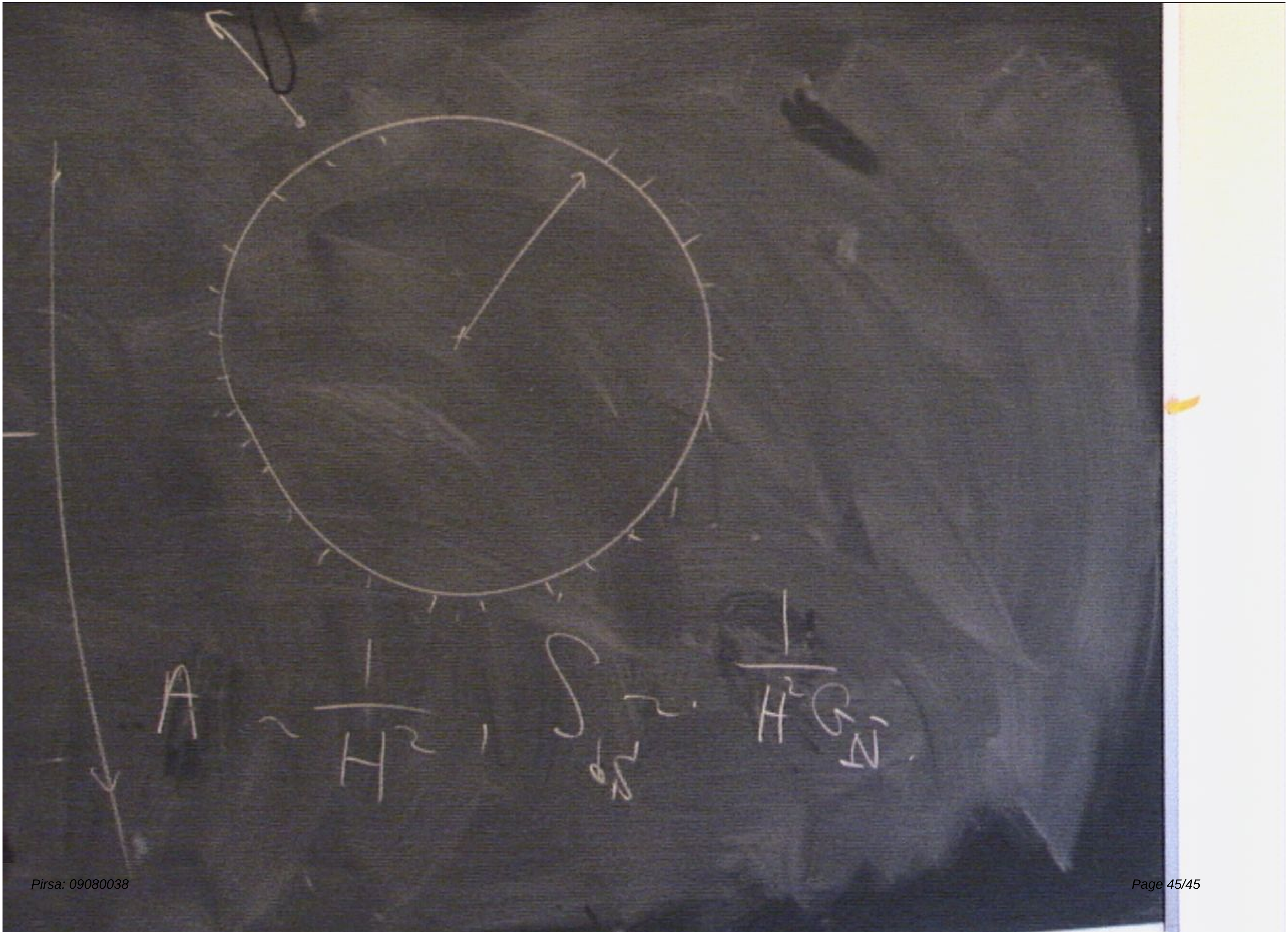
$\mathrm{Tr}_{N-k} \; |\psi$

$\times \; e^{-A/G_N}$

Locality

Fuzziness


$S \sim \frac{1}{H^2}$


$A \sim \frac{1}{H^2}$, $S_{dS} \sim \frac{1}{H^2 G_N}$