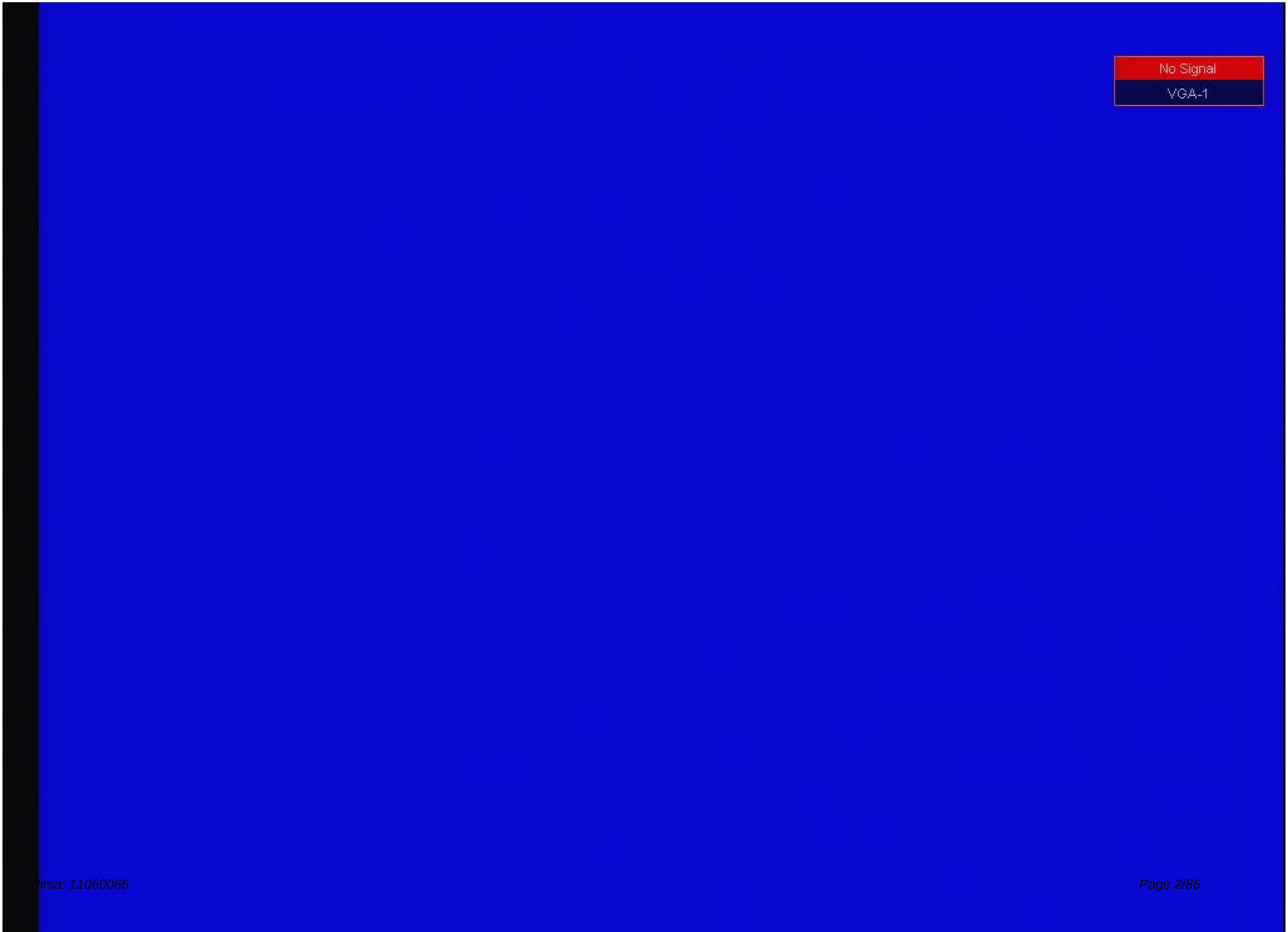
Title: Bulk Physics from CFT

Date: Jun 23, 2011 09:00 AM

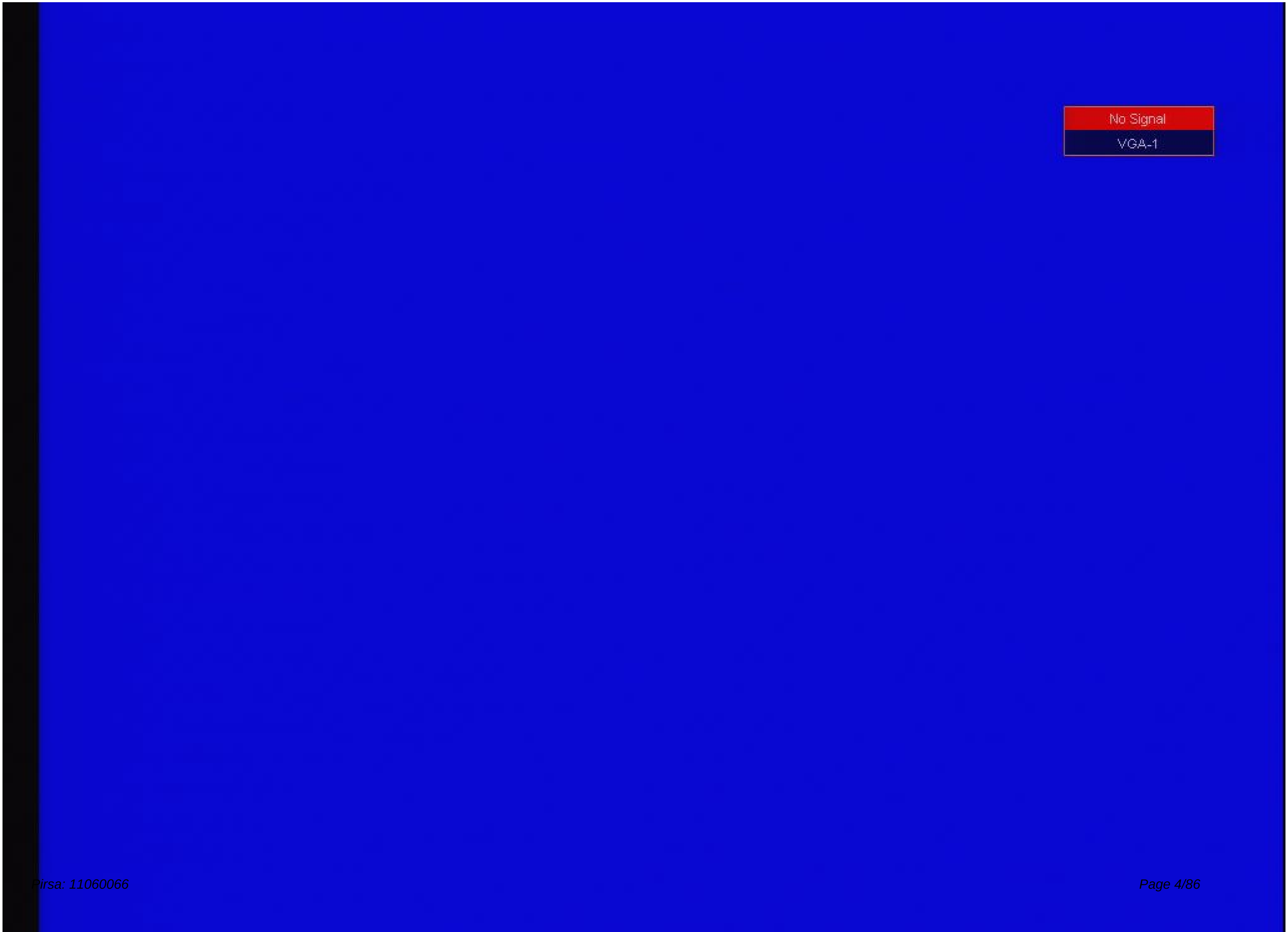
URL: http://pirsa.org/11060066

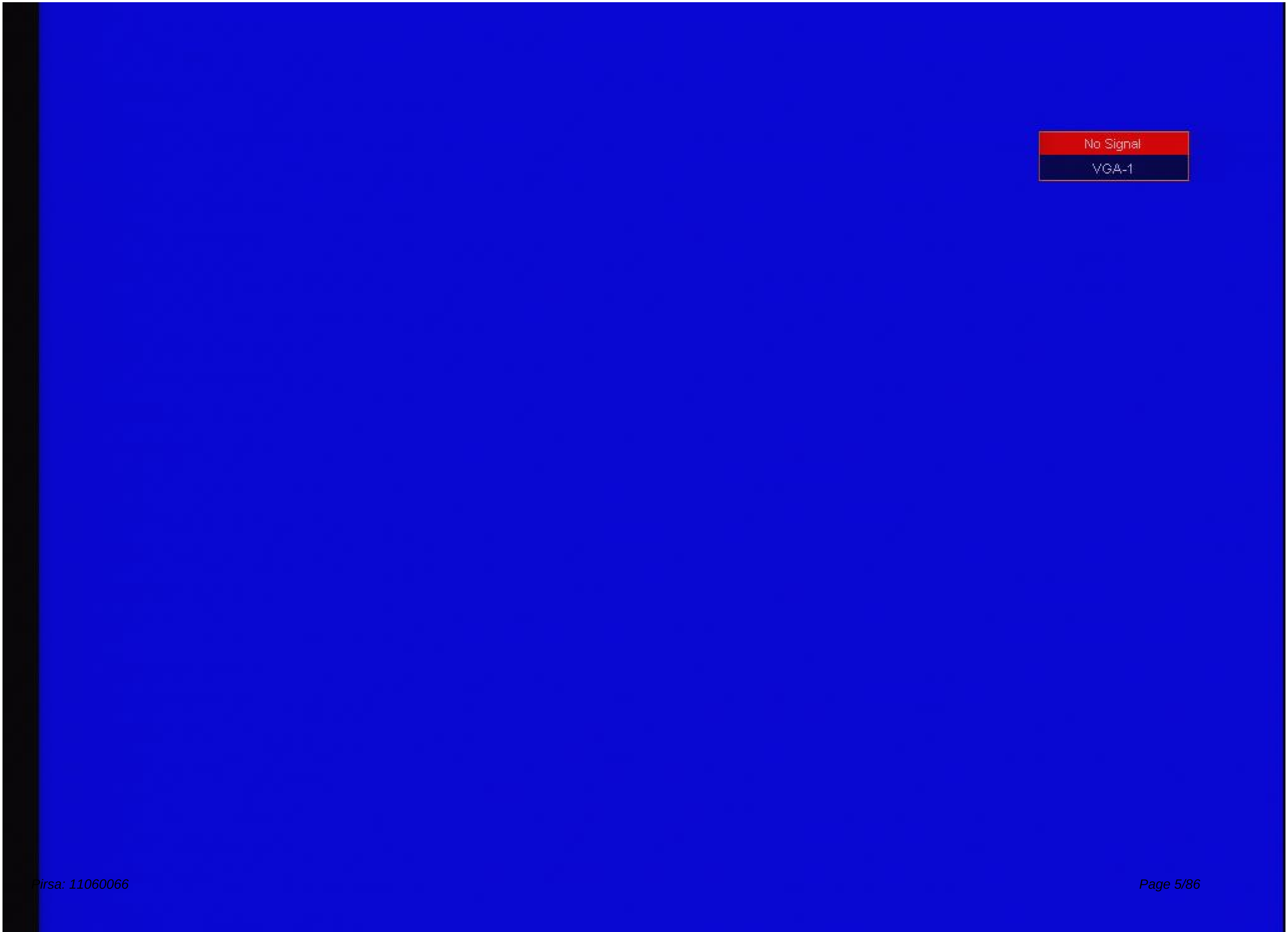
Abstract: Gauge/gravity duality is our most complete construction of quantum gravity, but it gives in a simple way only the observations of an observer at the AdS boundary. I discuss various issues regarding the representation of the bulk physics.


No Signal
VGA-1

No Signal

VGA-1

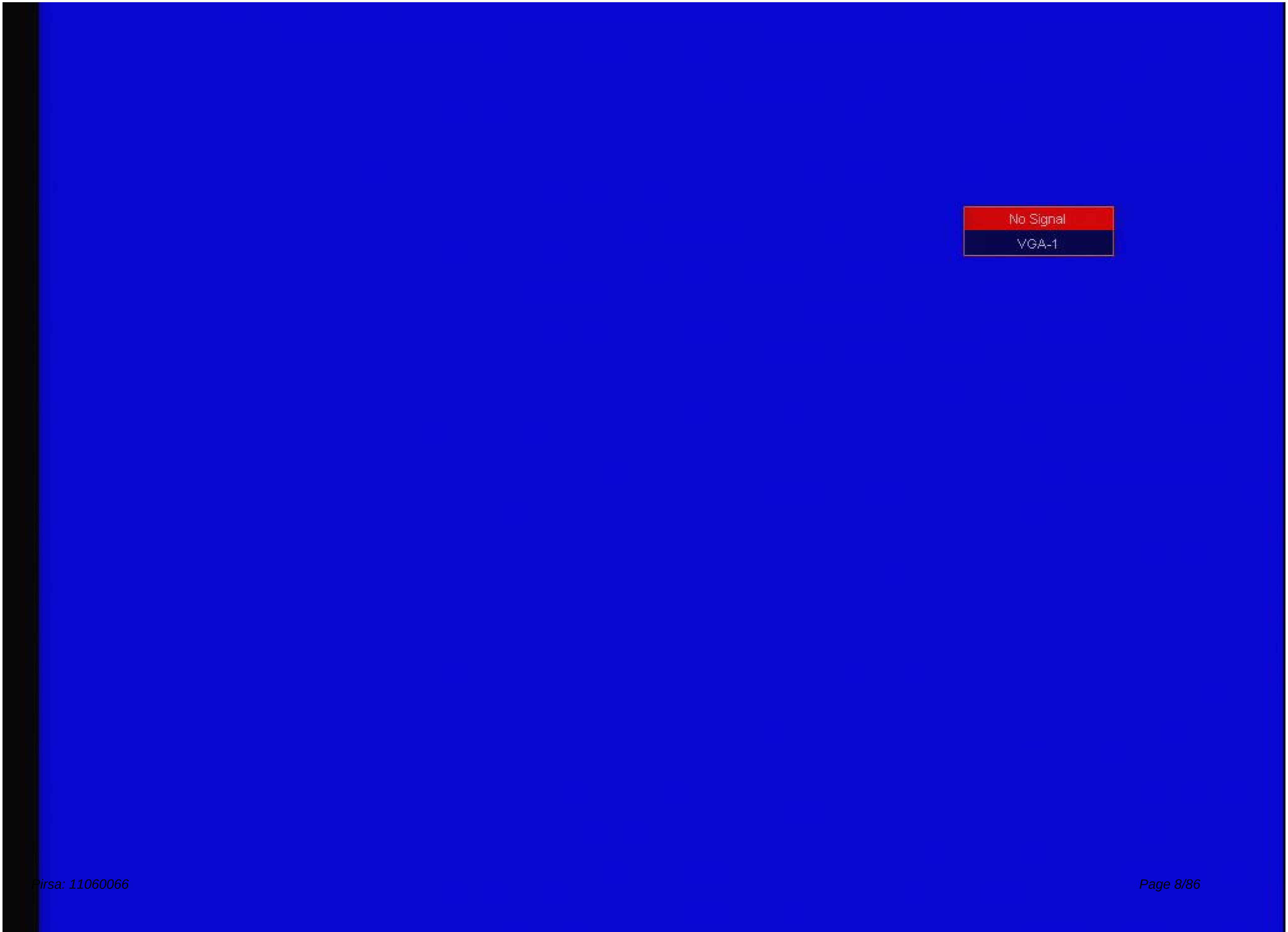

No Signal
VGA-1

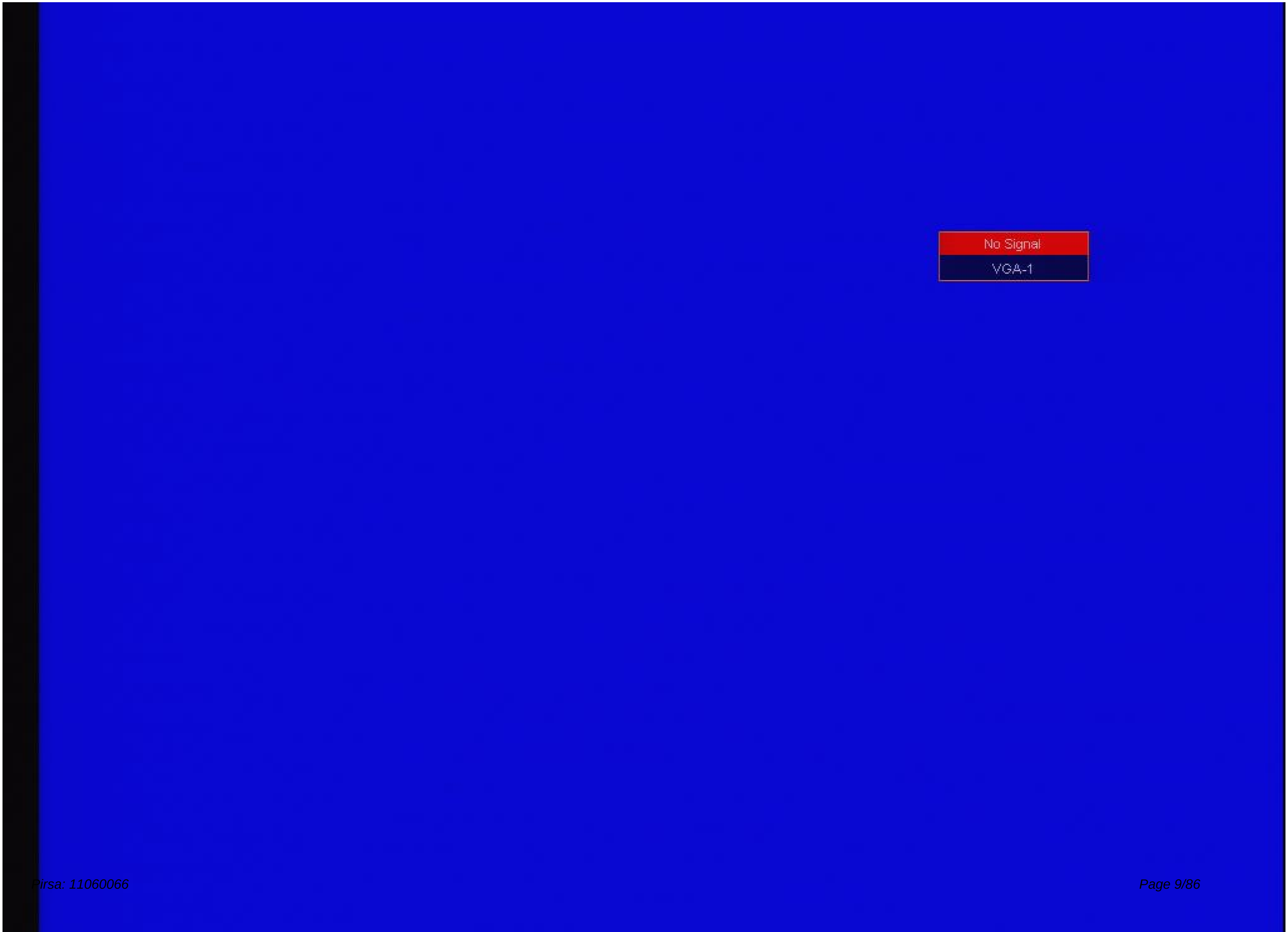

No Signal
VGA-1

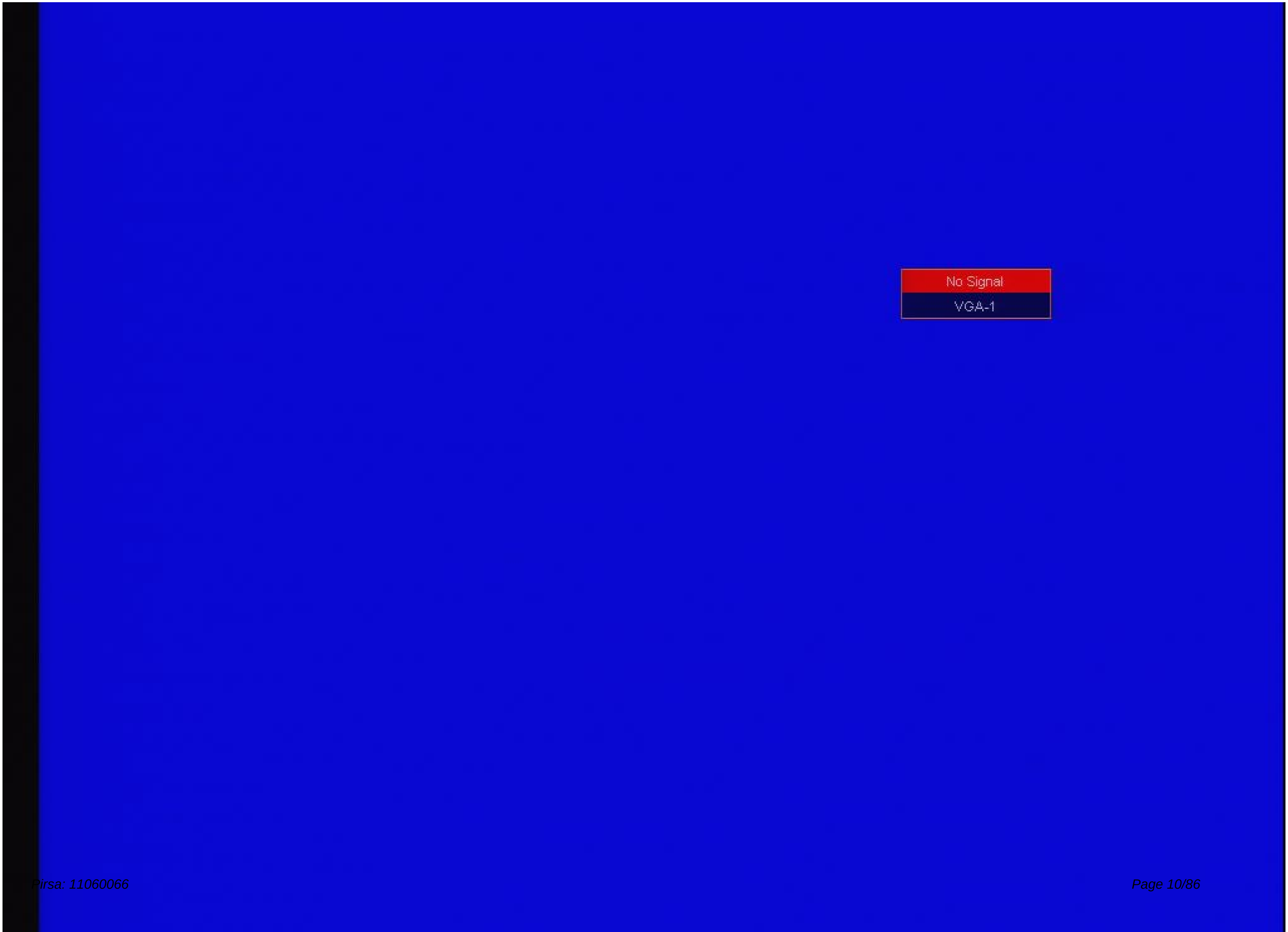
No Signal

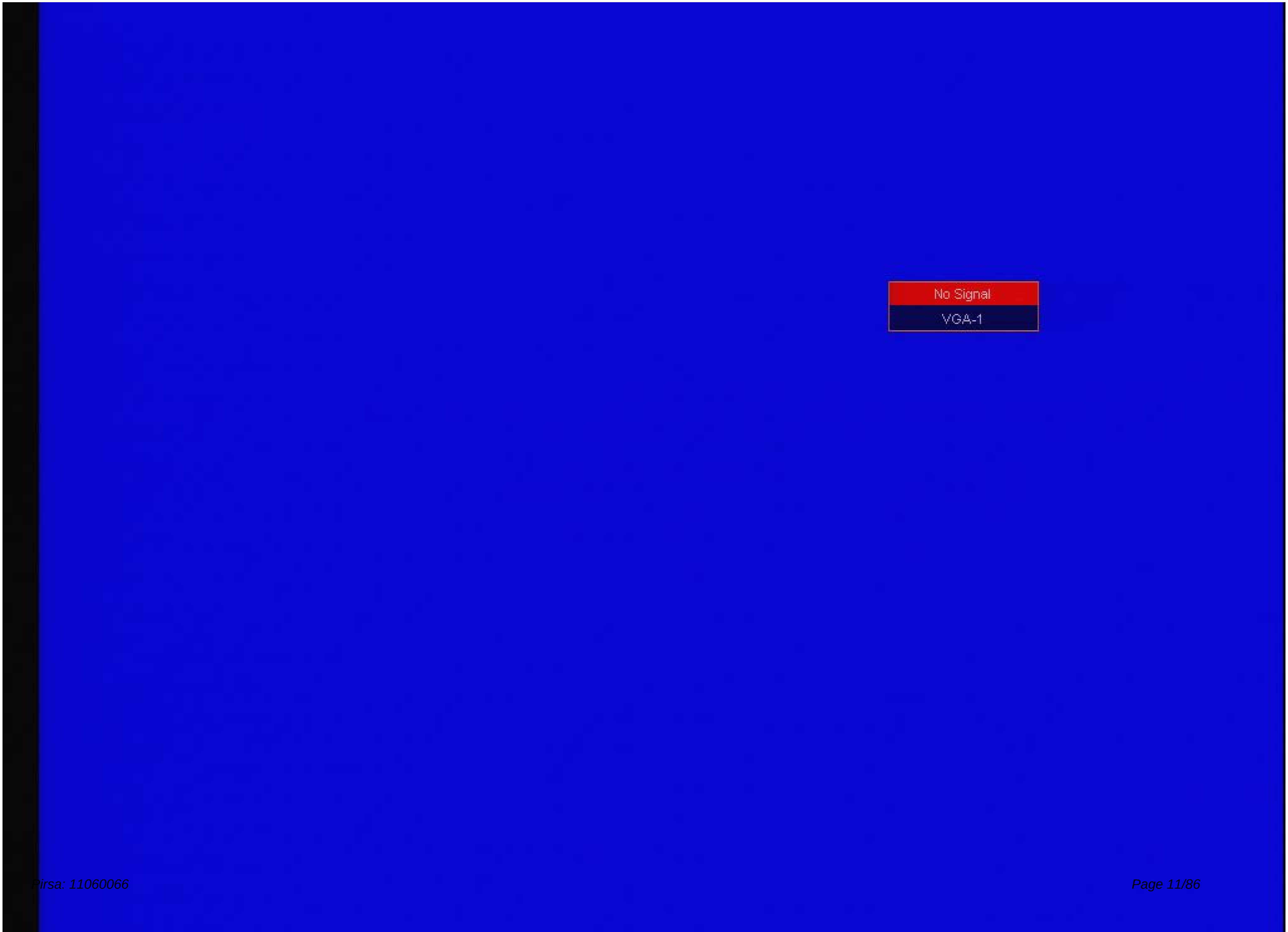
VGA-1

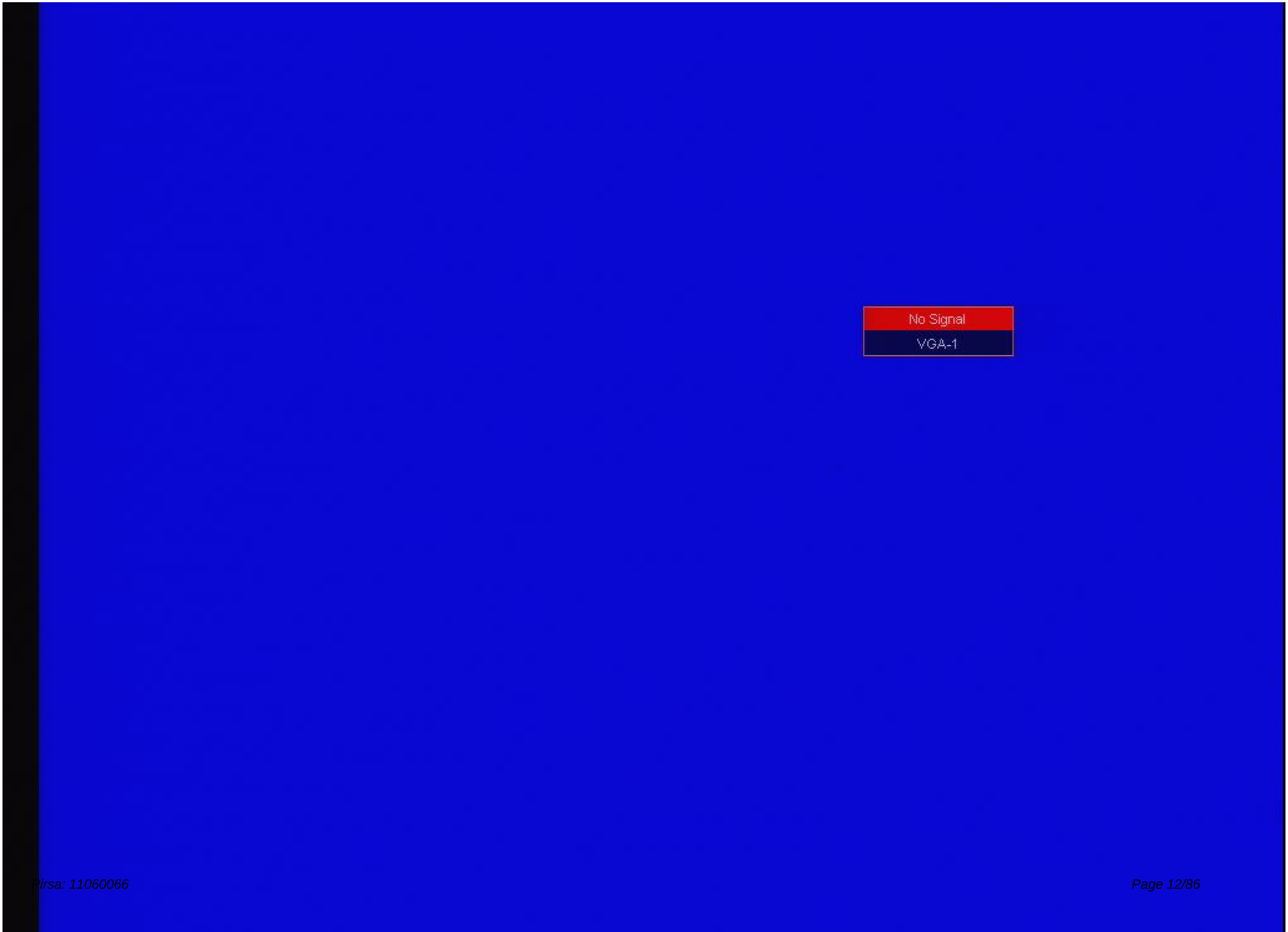

No Signal
VGA-1

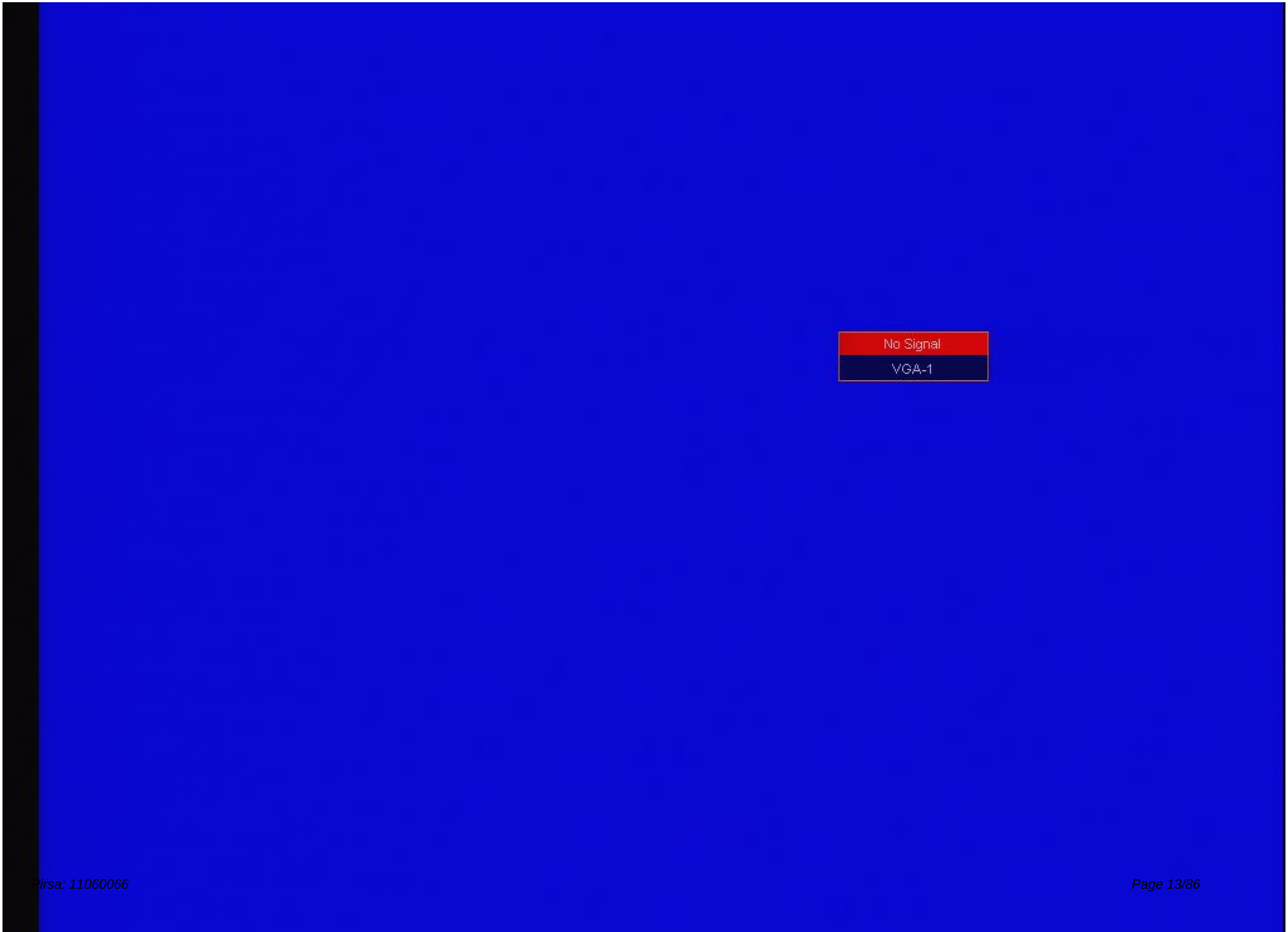

No Signal
VGA-1

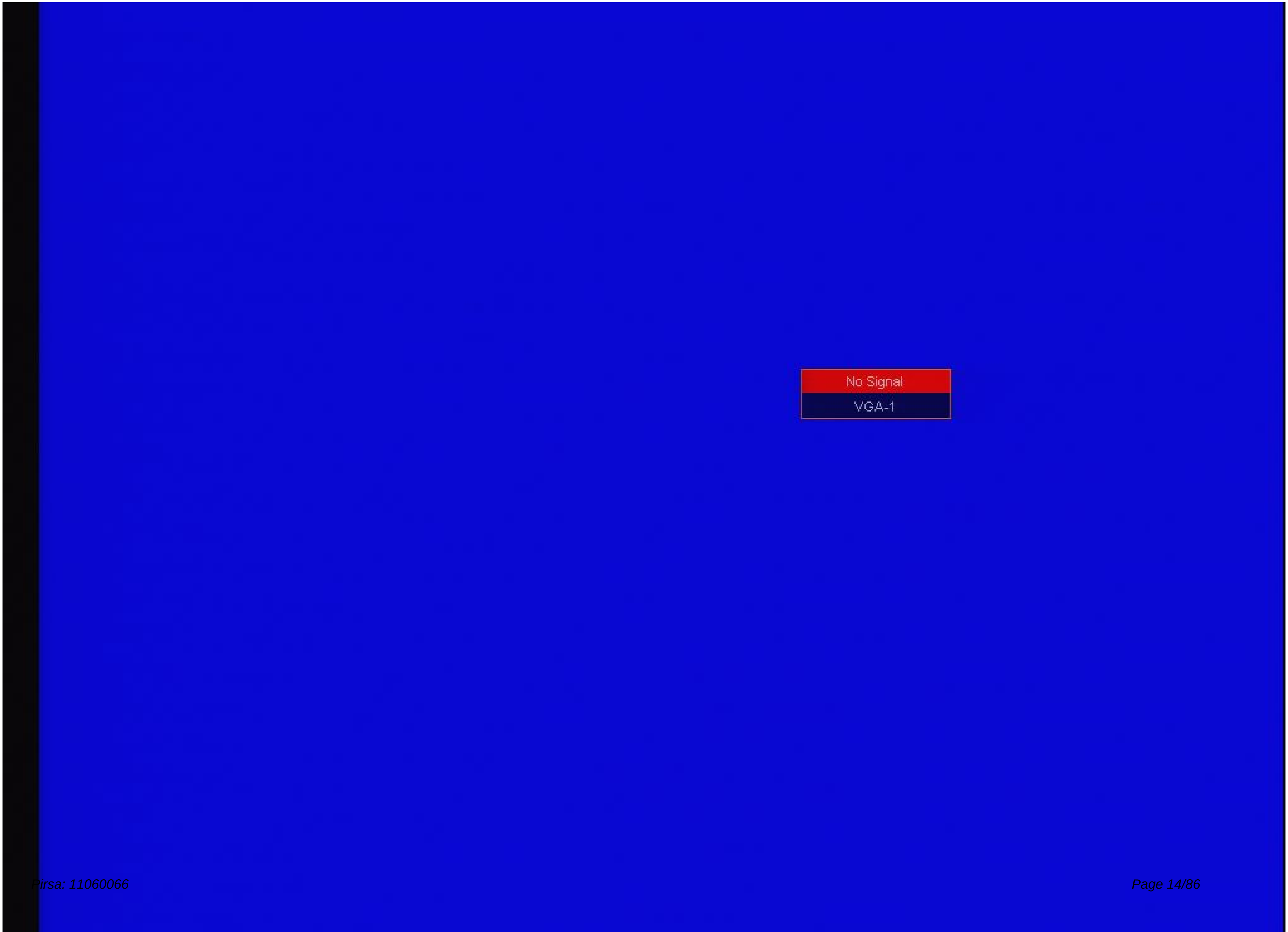

No Signal
VGA-1

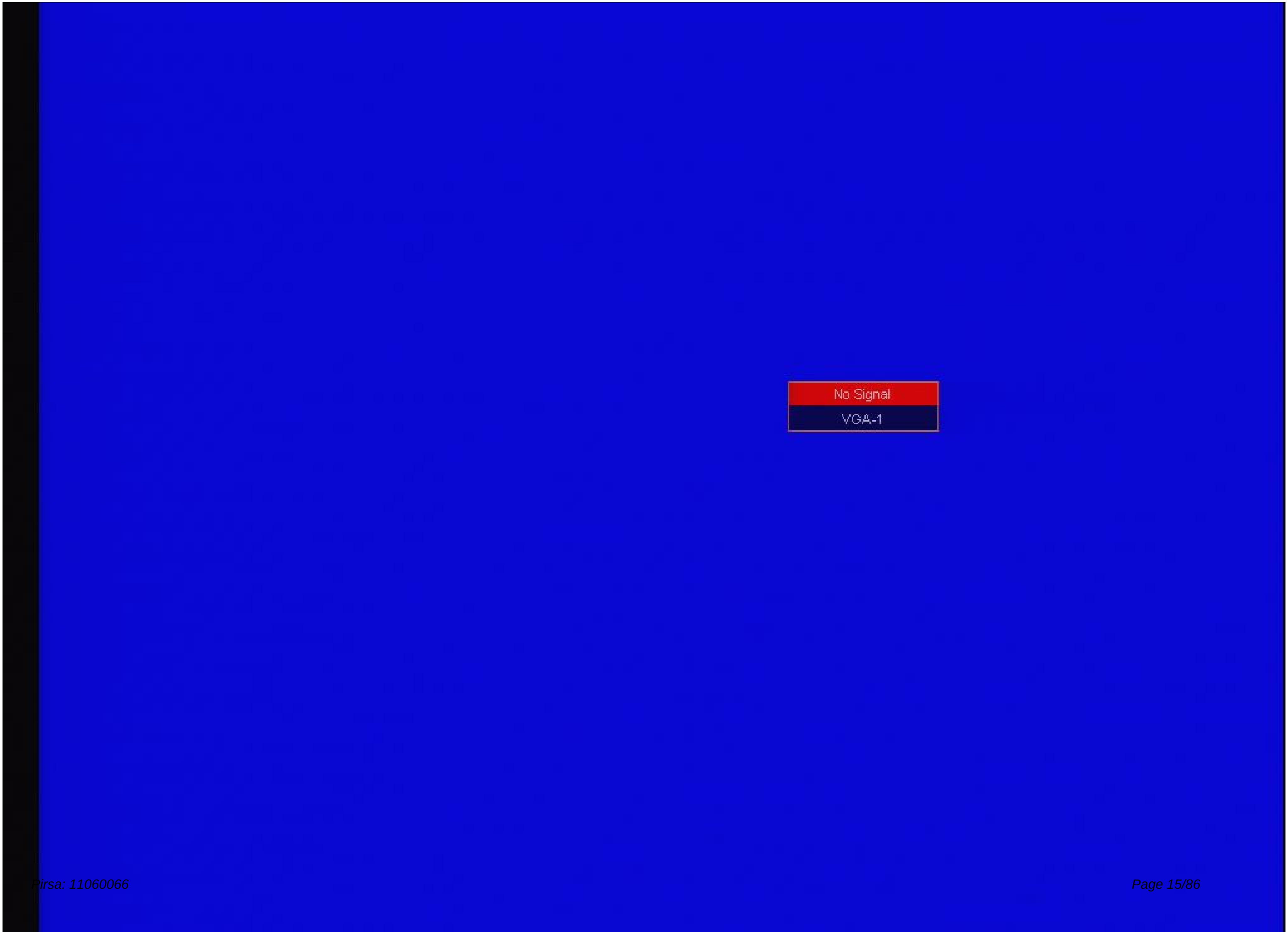

No Signal
VGA-1

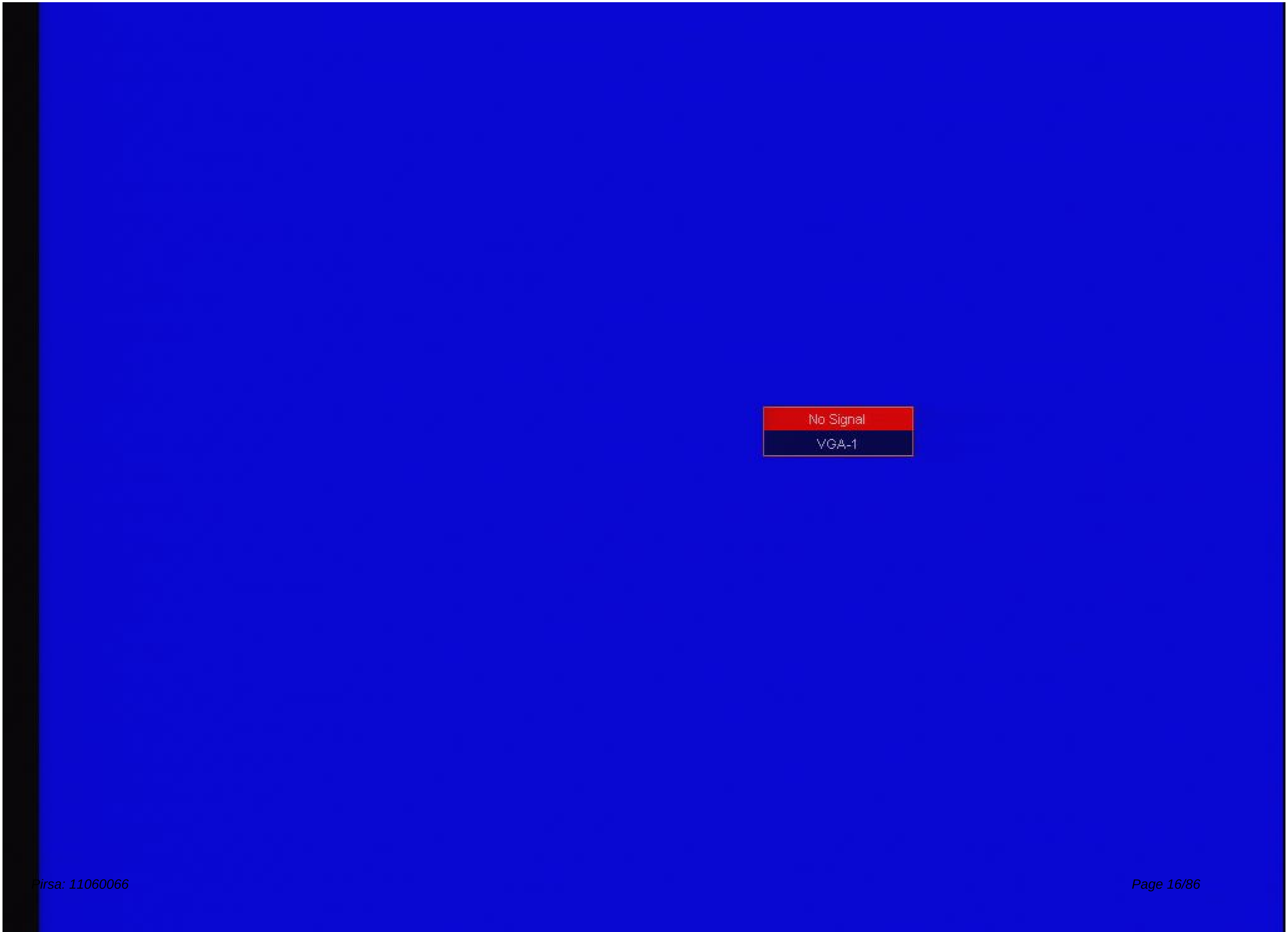

No Signal
VGA-1

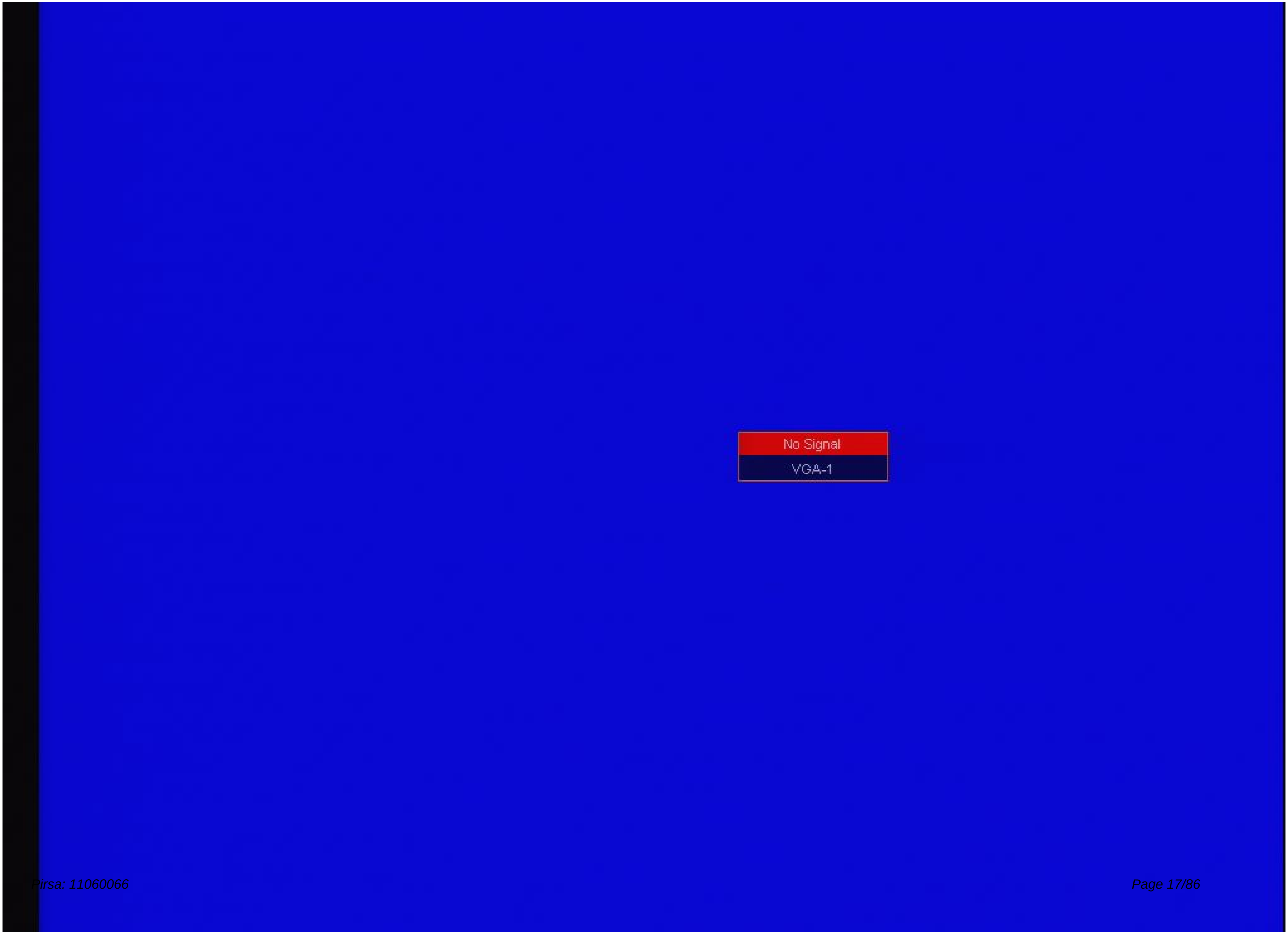

No Signal
VGA-1


No Signal
VGA-1

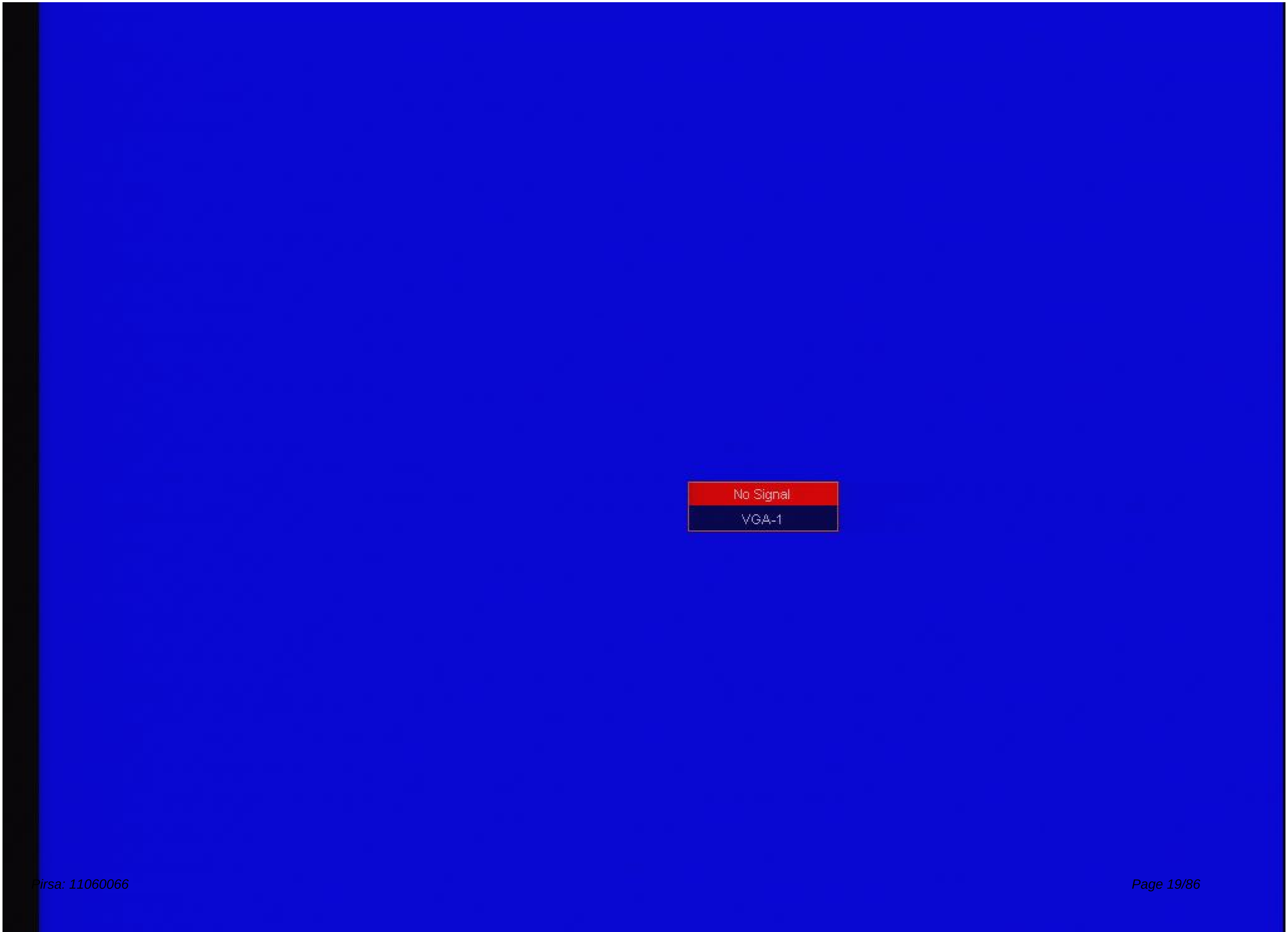

No Signal
VGA-1

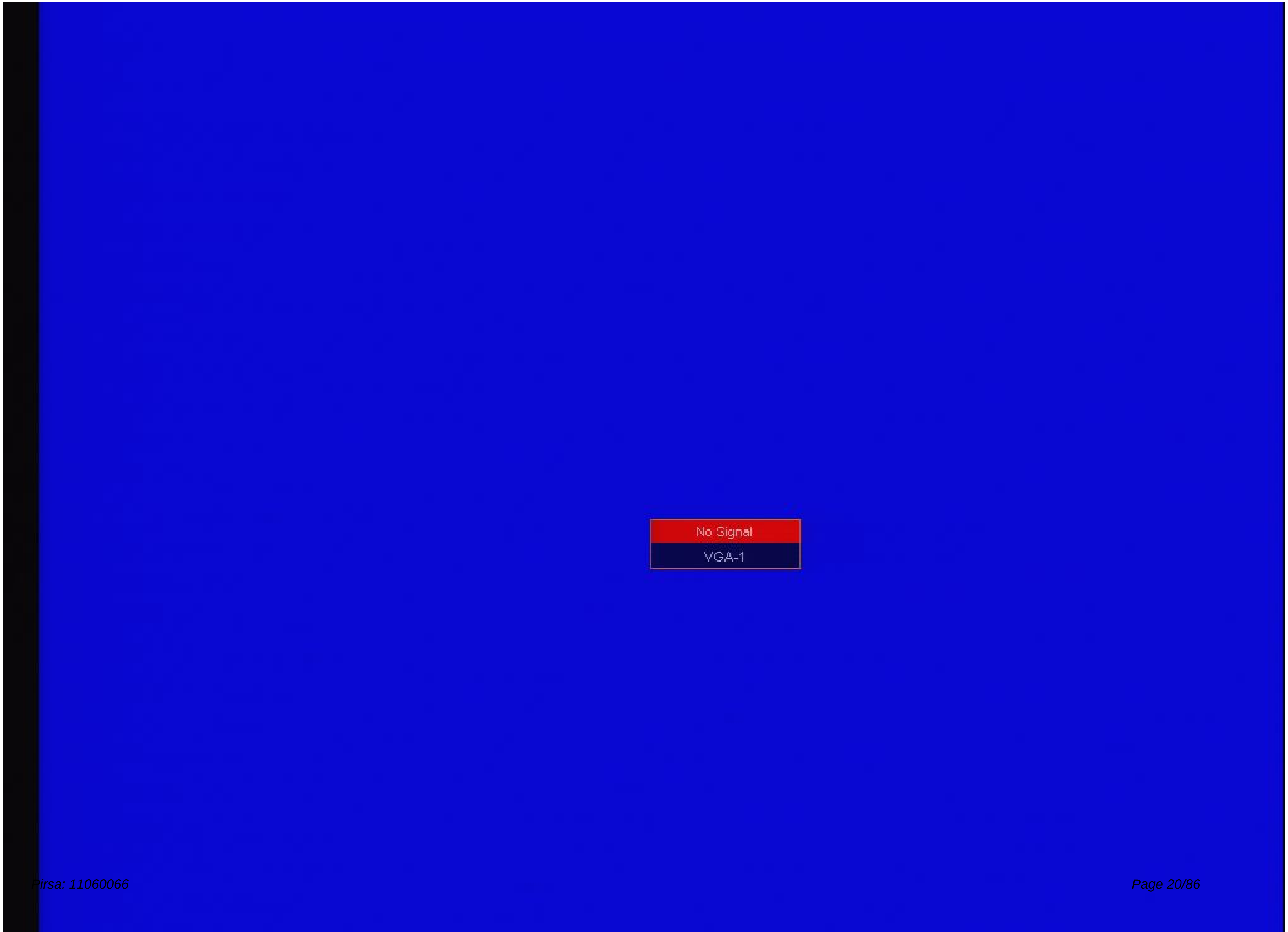

No Signal
VGA-1


No Signal
VGA-1

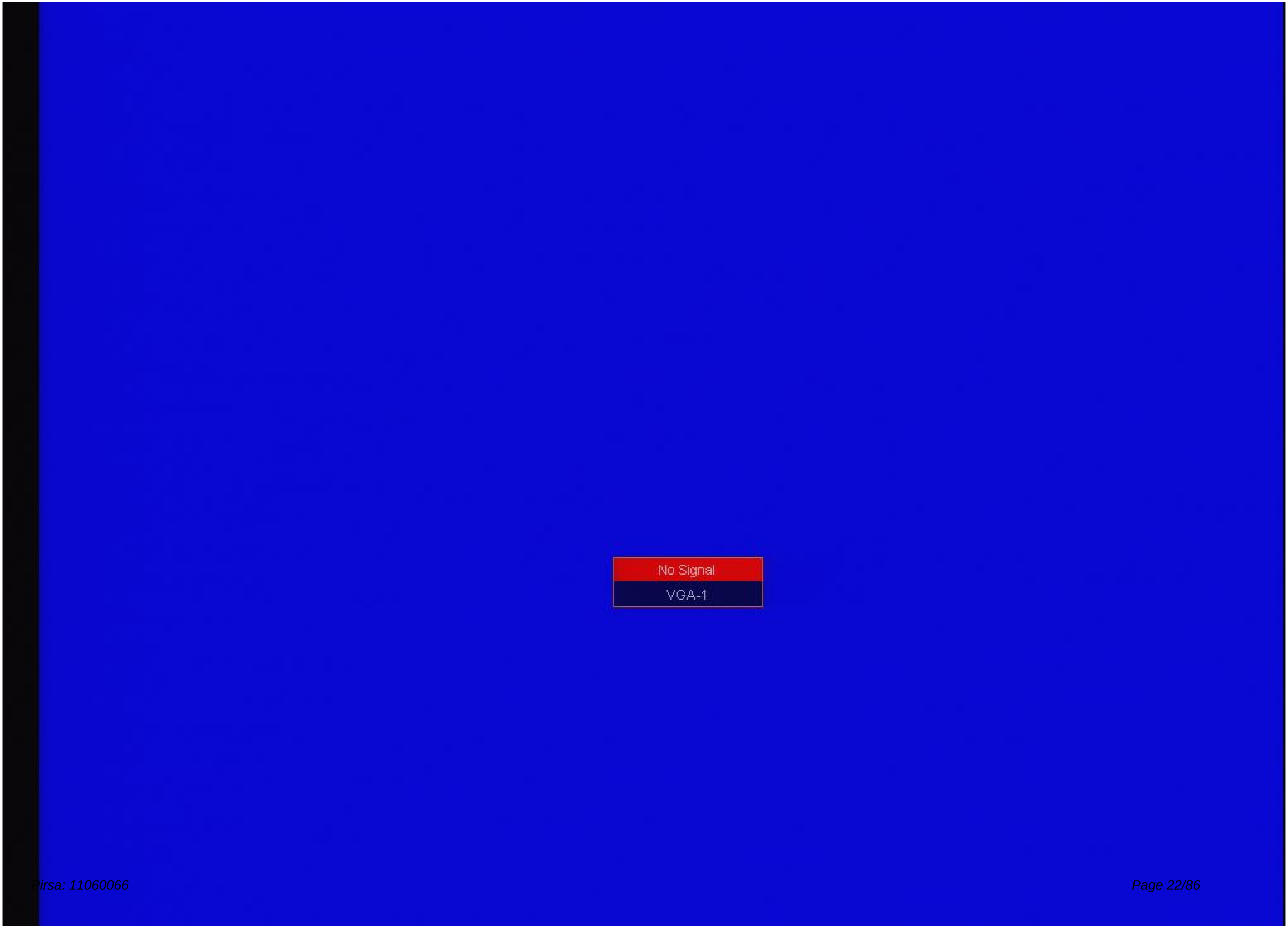

No Signal
VGA-1

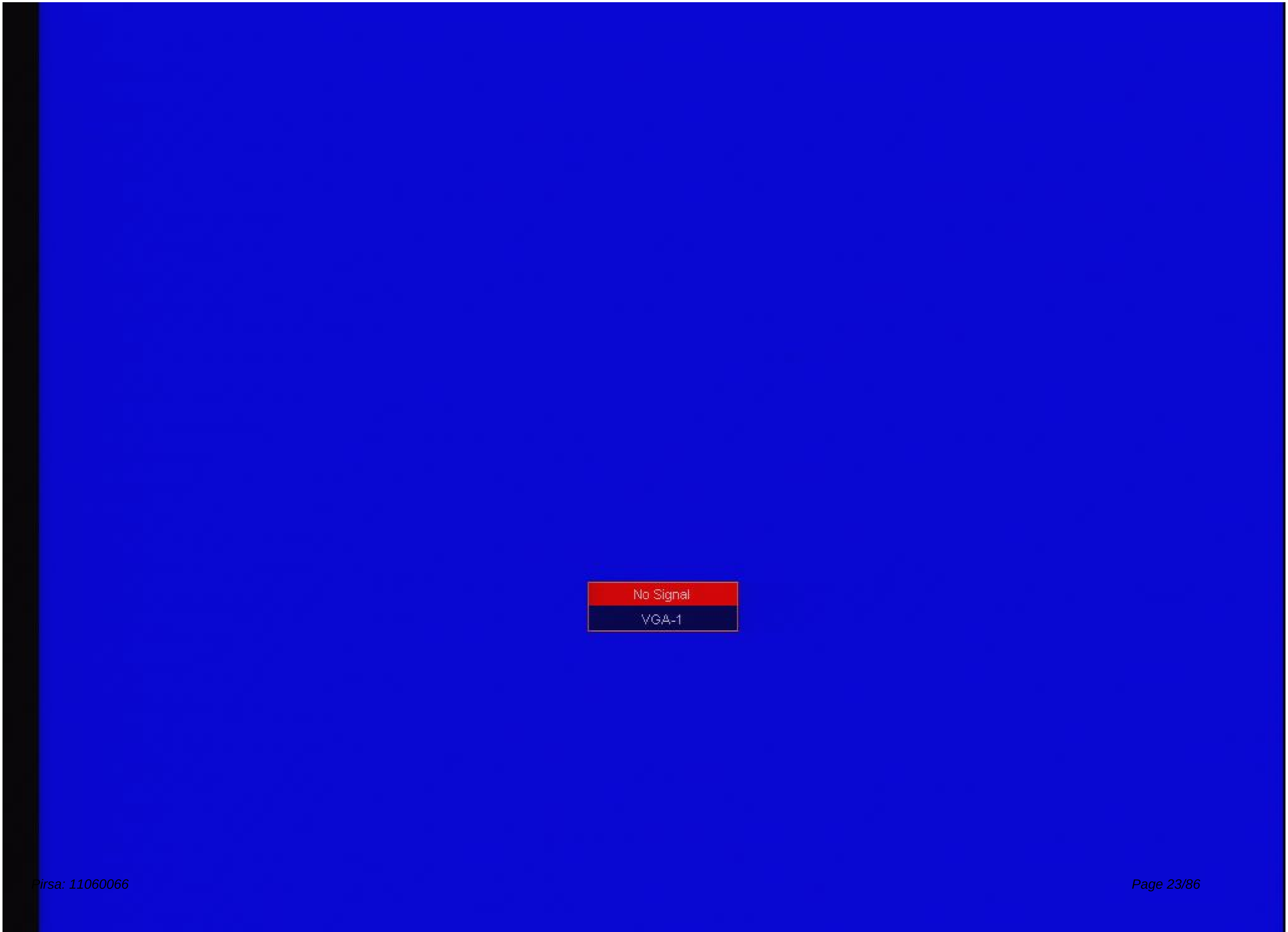
No Signal
VGA-1

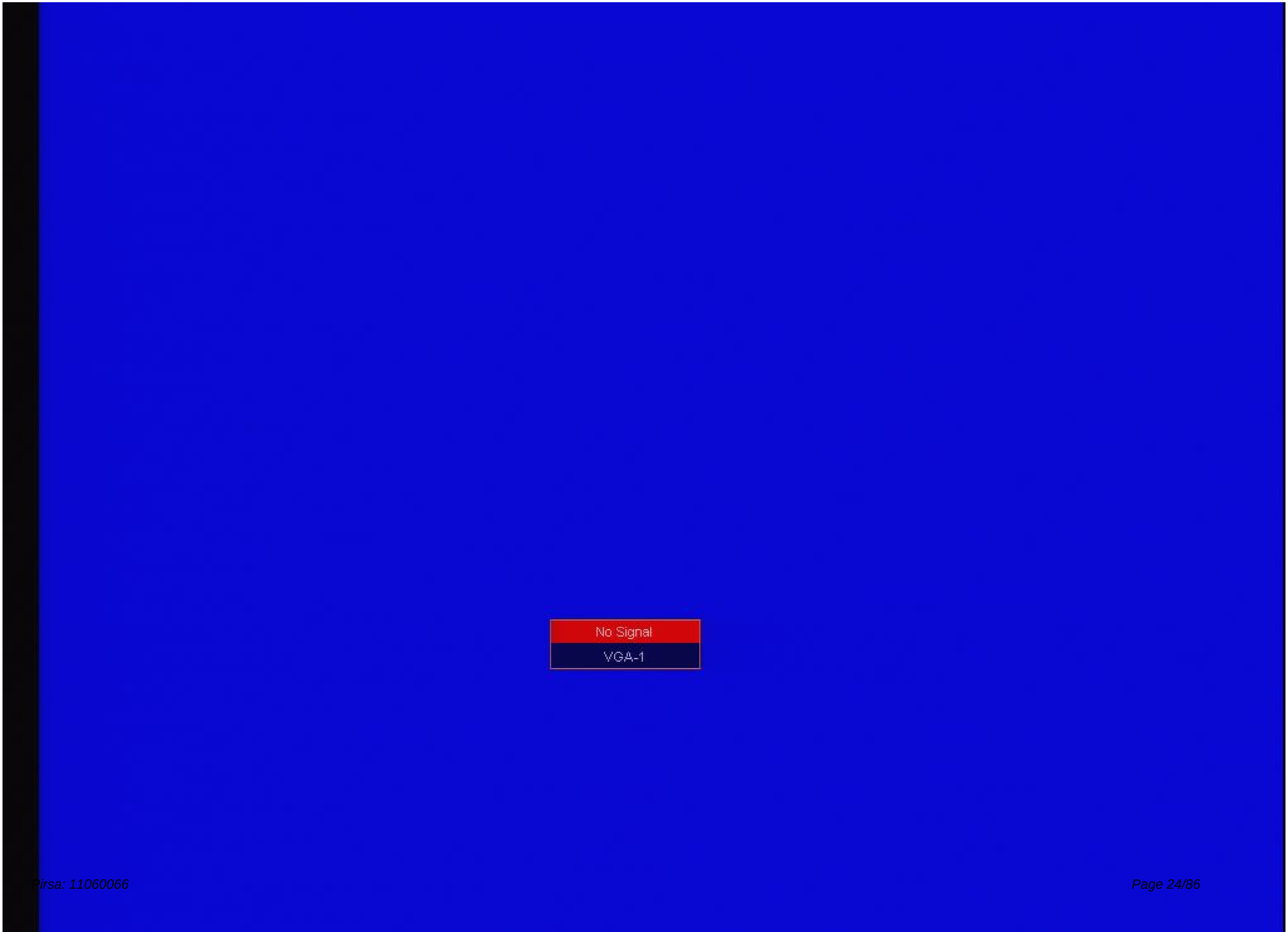

No Signal
VGA-1


No Signal
VGA-1

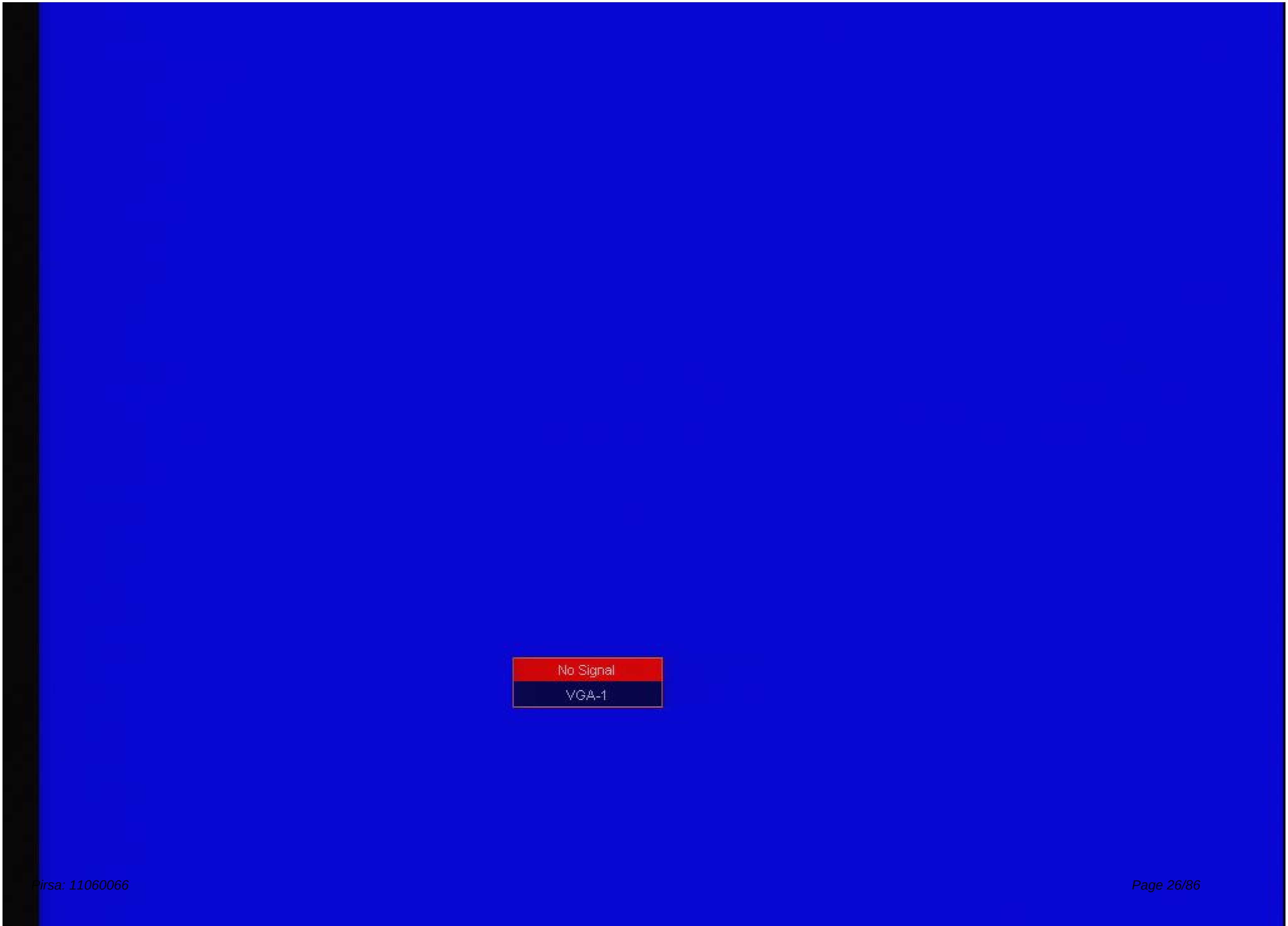
No Signal
VGA-1

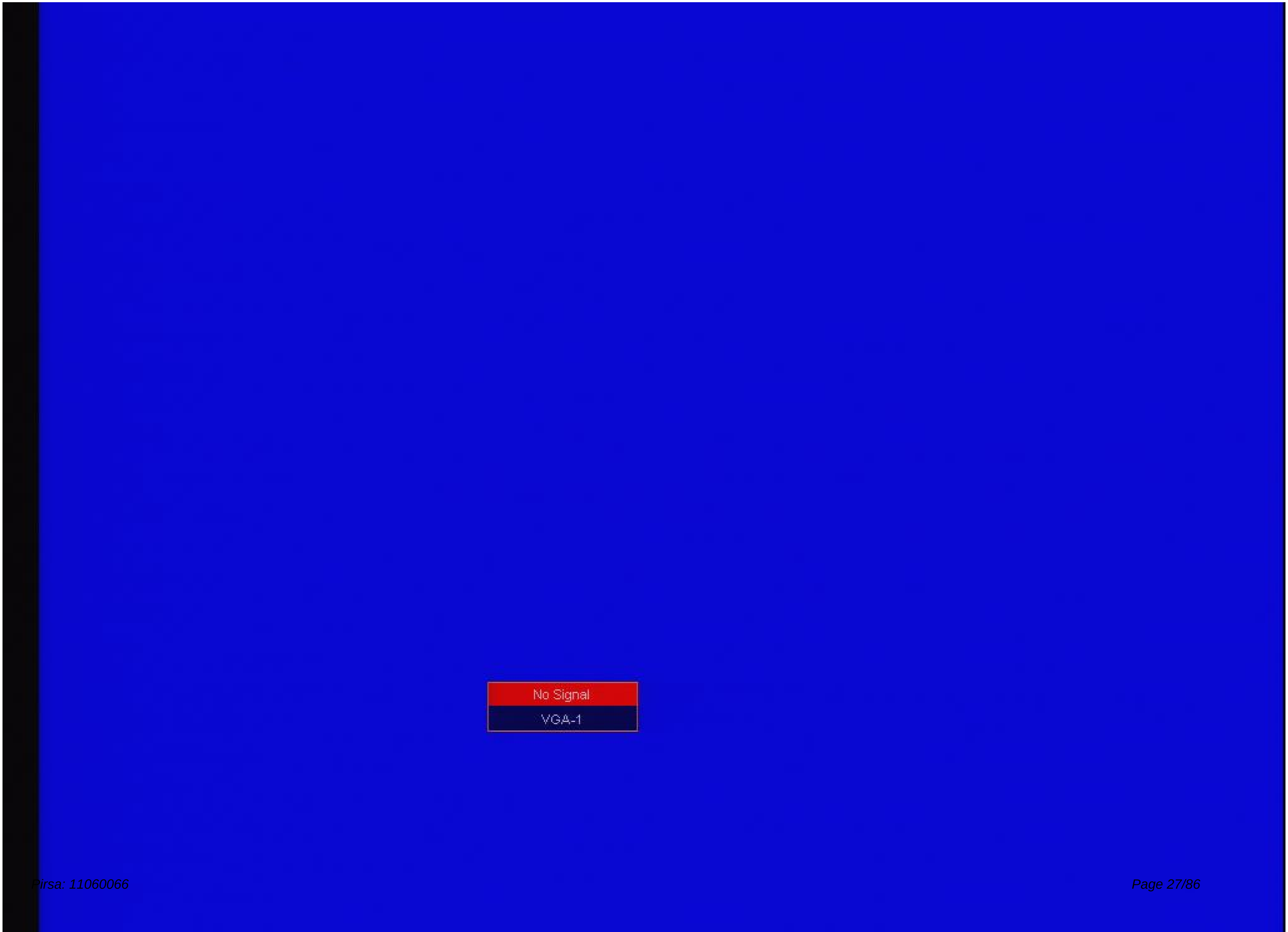

No Signal
VGA-1


No Signal
VGA-1


No Signal
VGA-1

No Signal
VGA-1

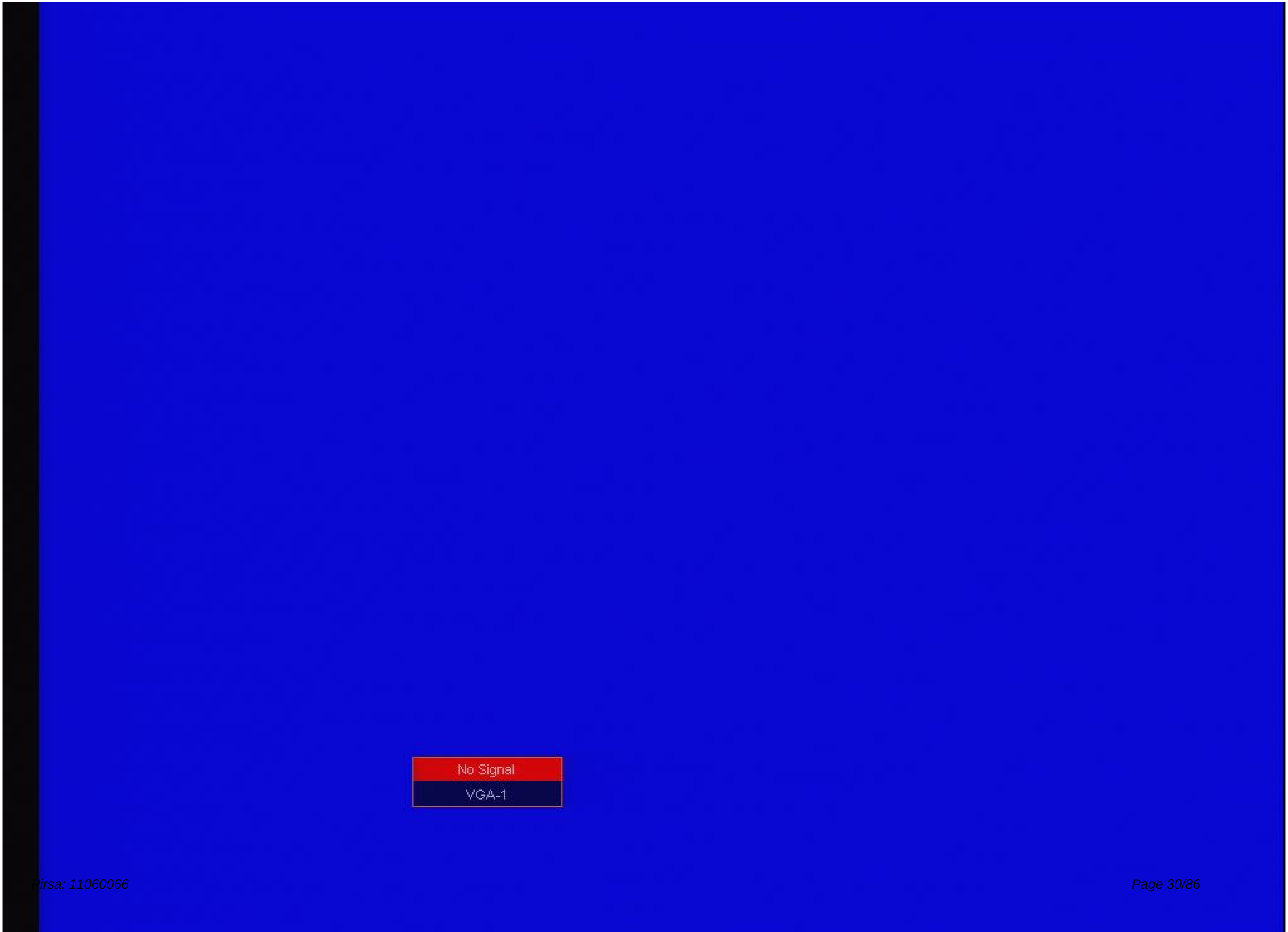

No Signal
VGA-1

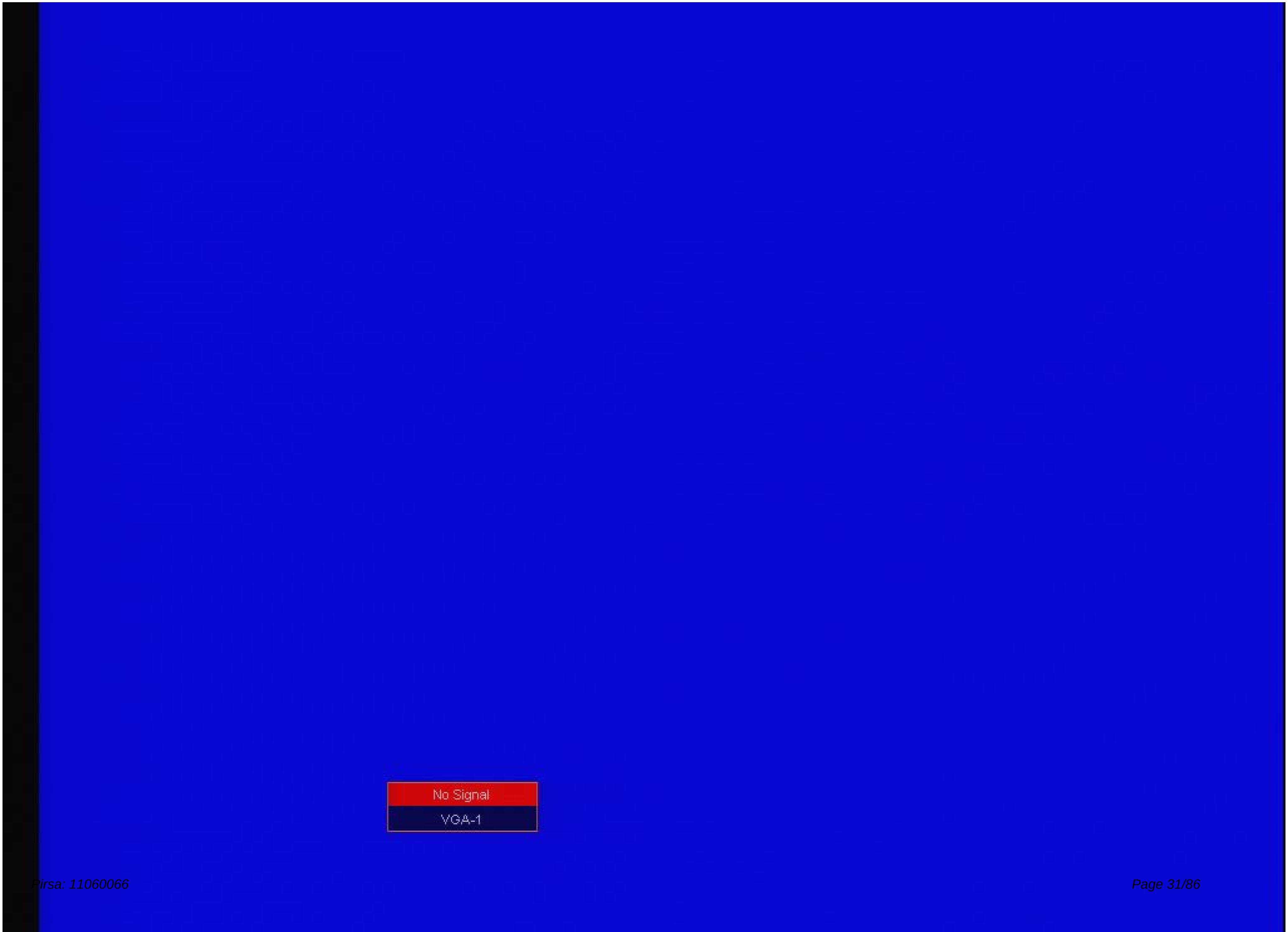

No Signal
VGA-1

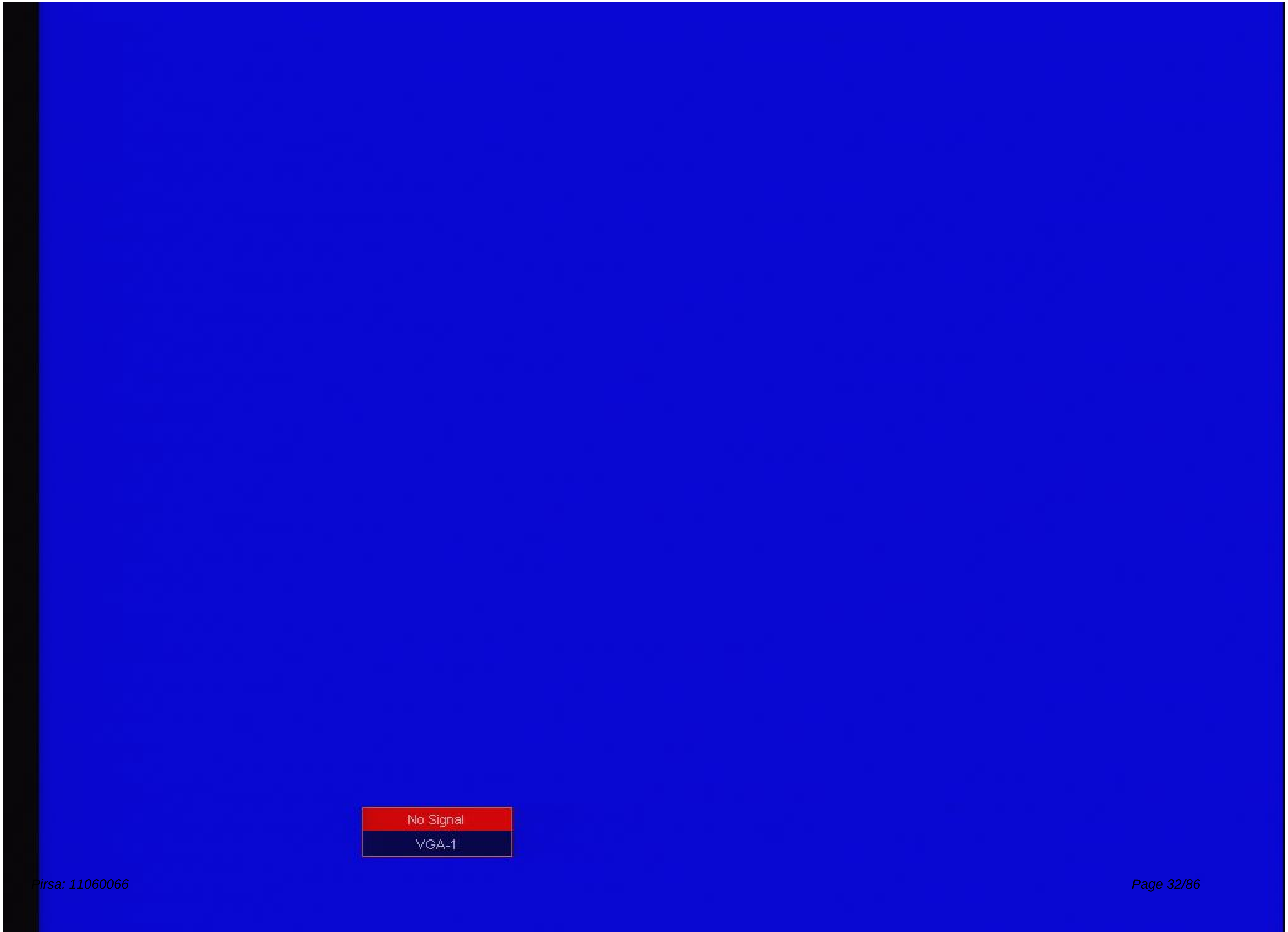
No Signal

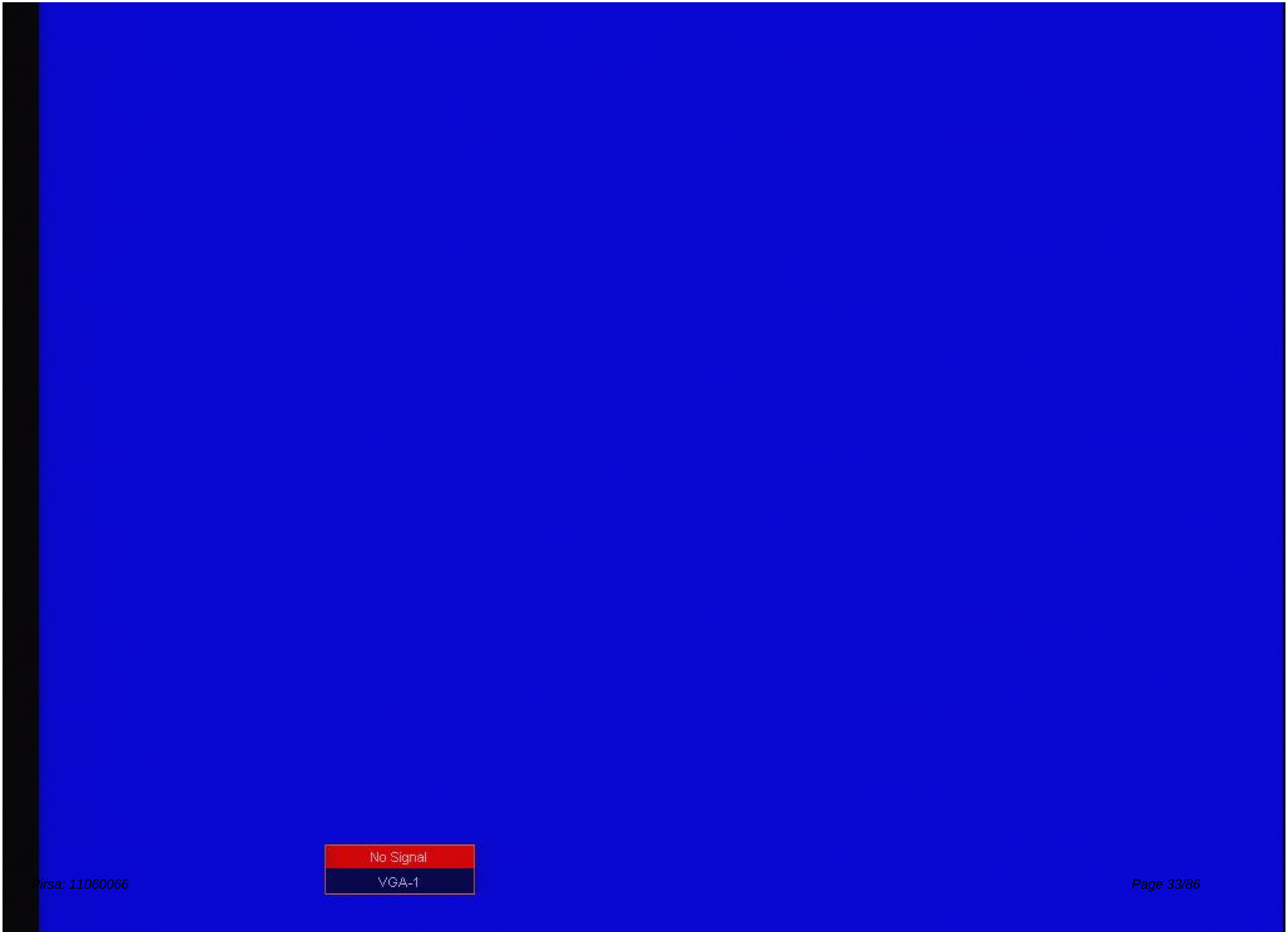
VGA-1

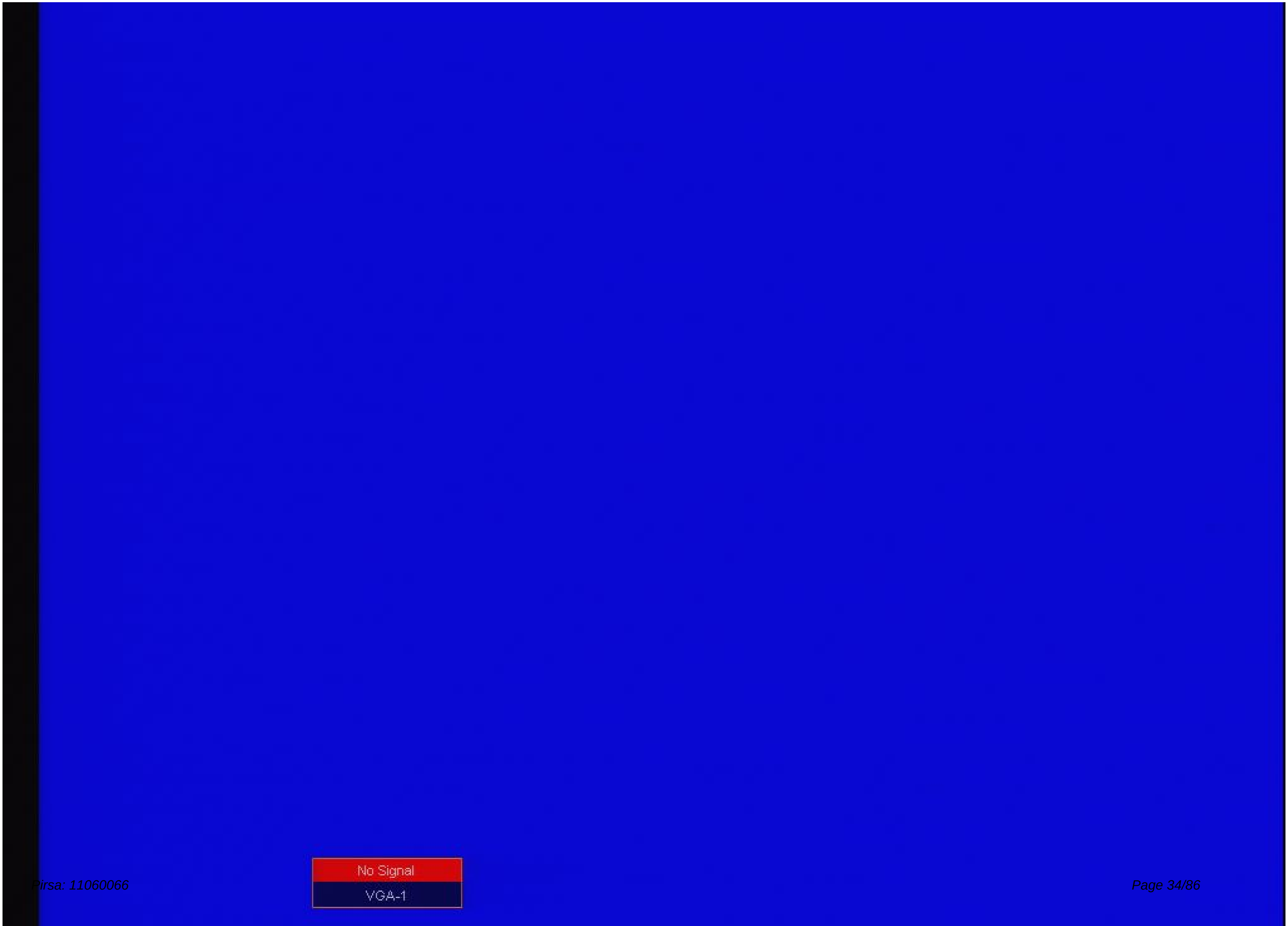
No Signal
VGA-1


No Signal
VGA-1

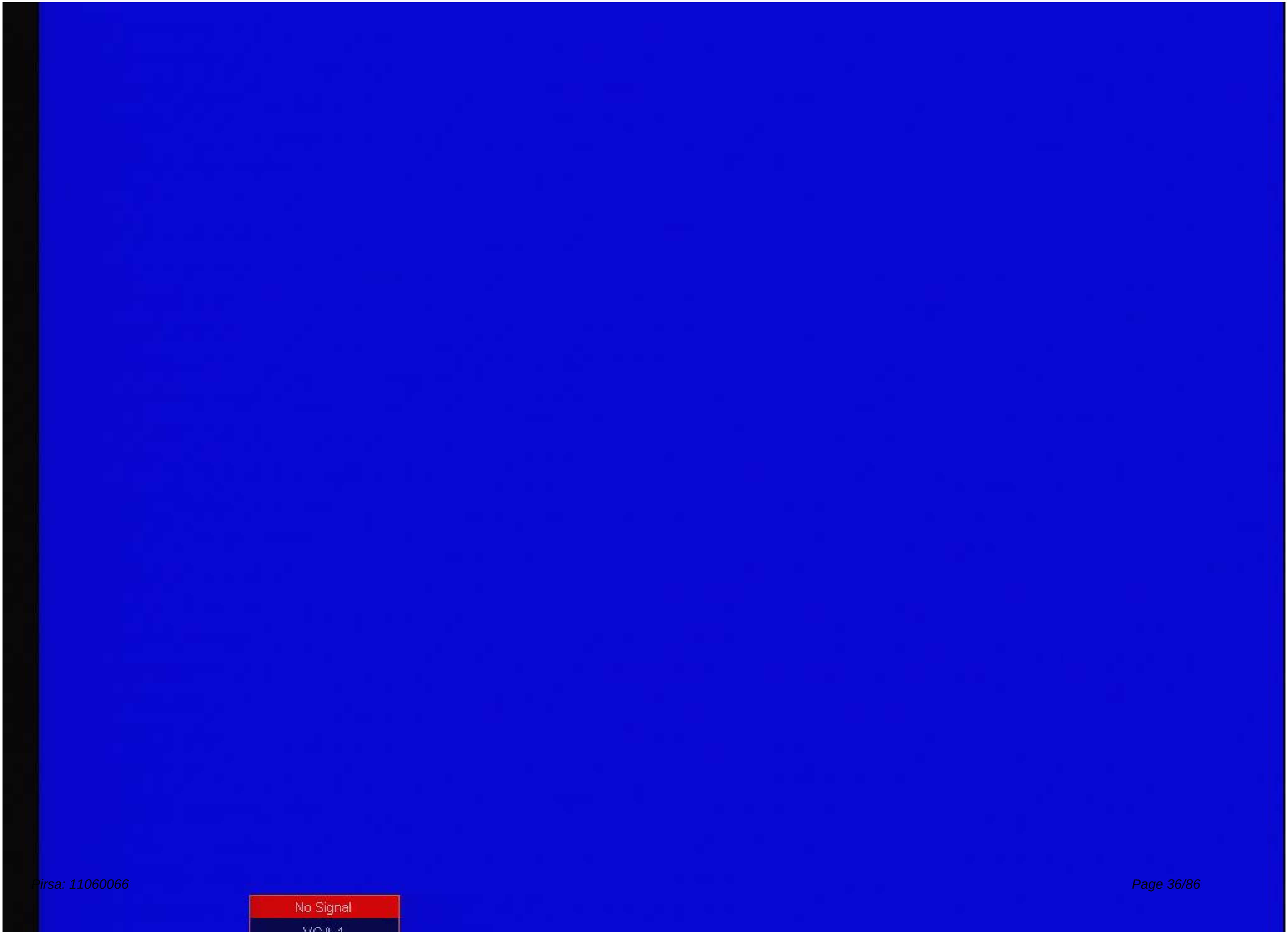

No Signal
VGA-1

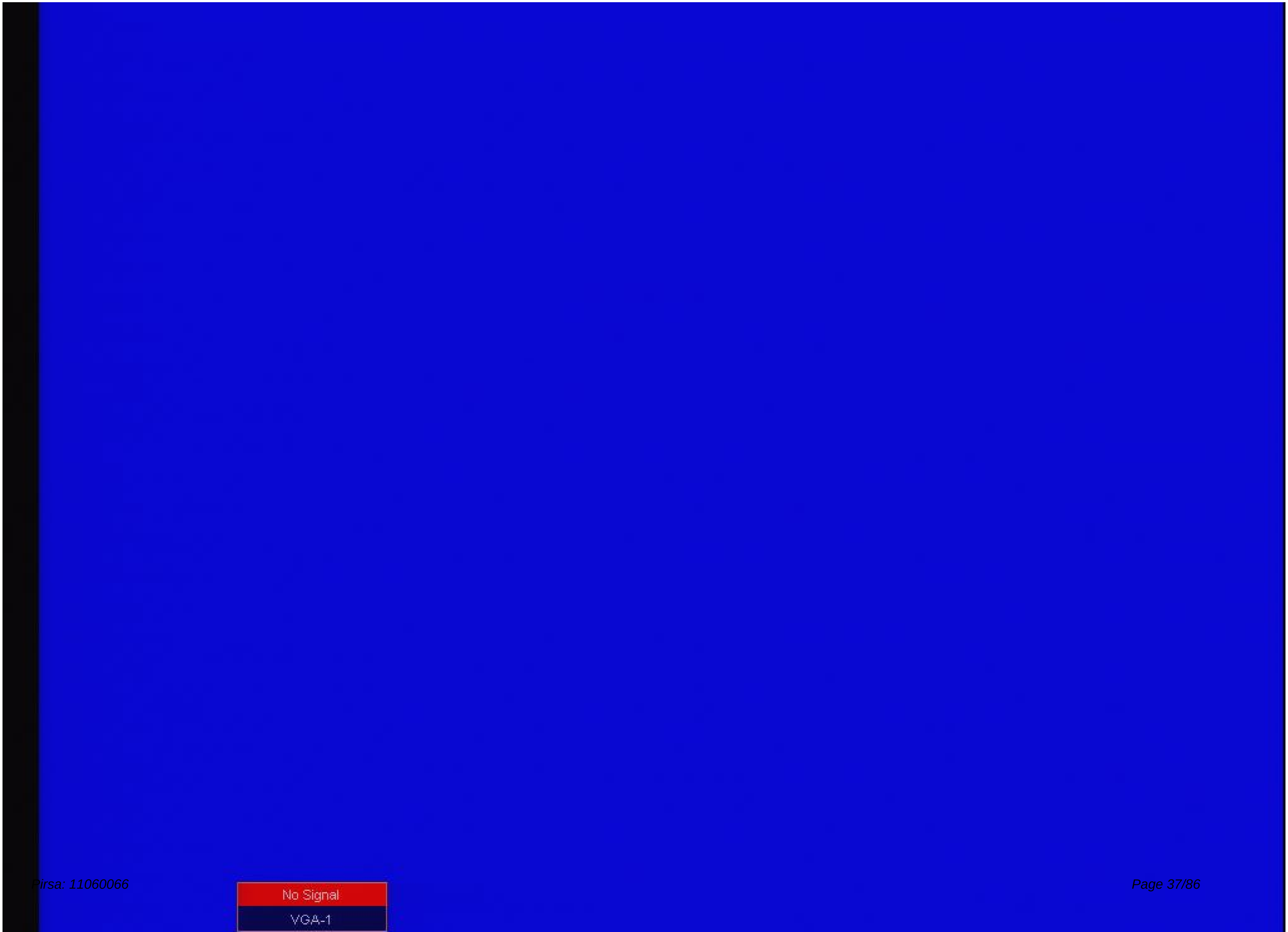

No Signal
VGA-1

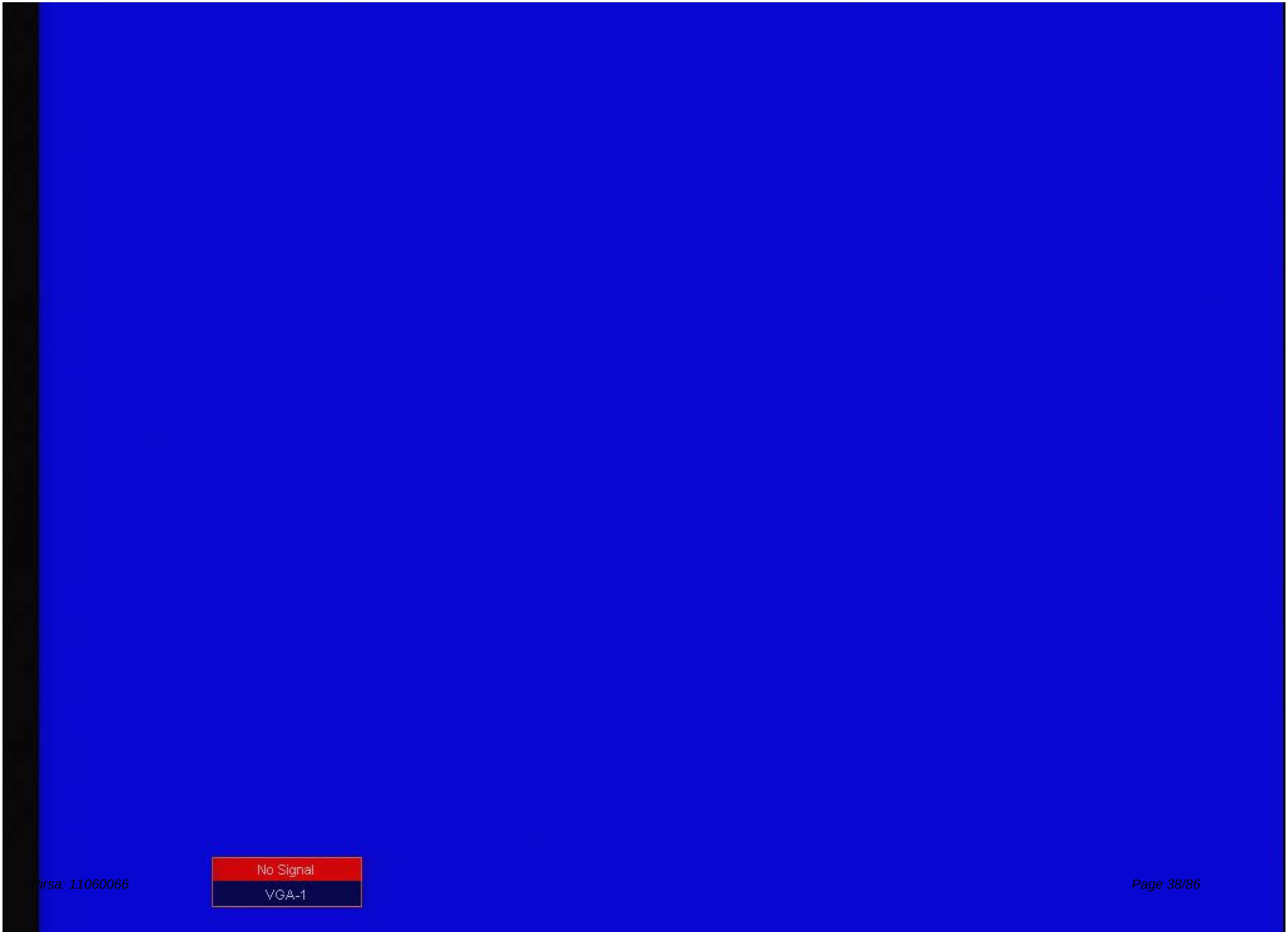

No Signal
VGA-1

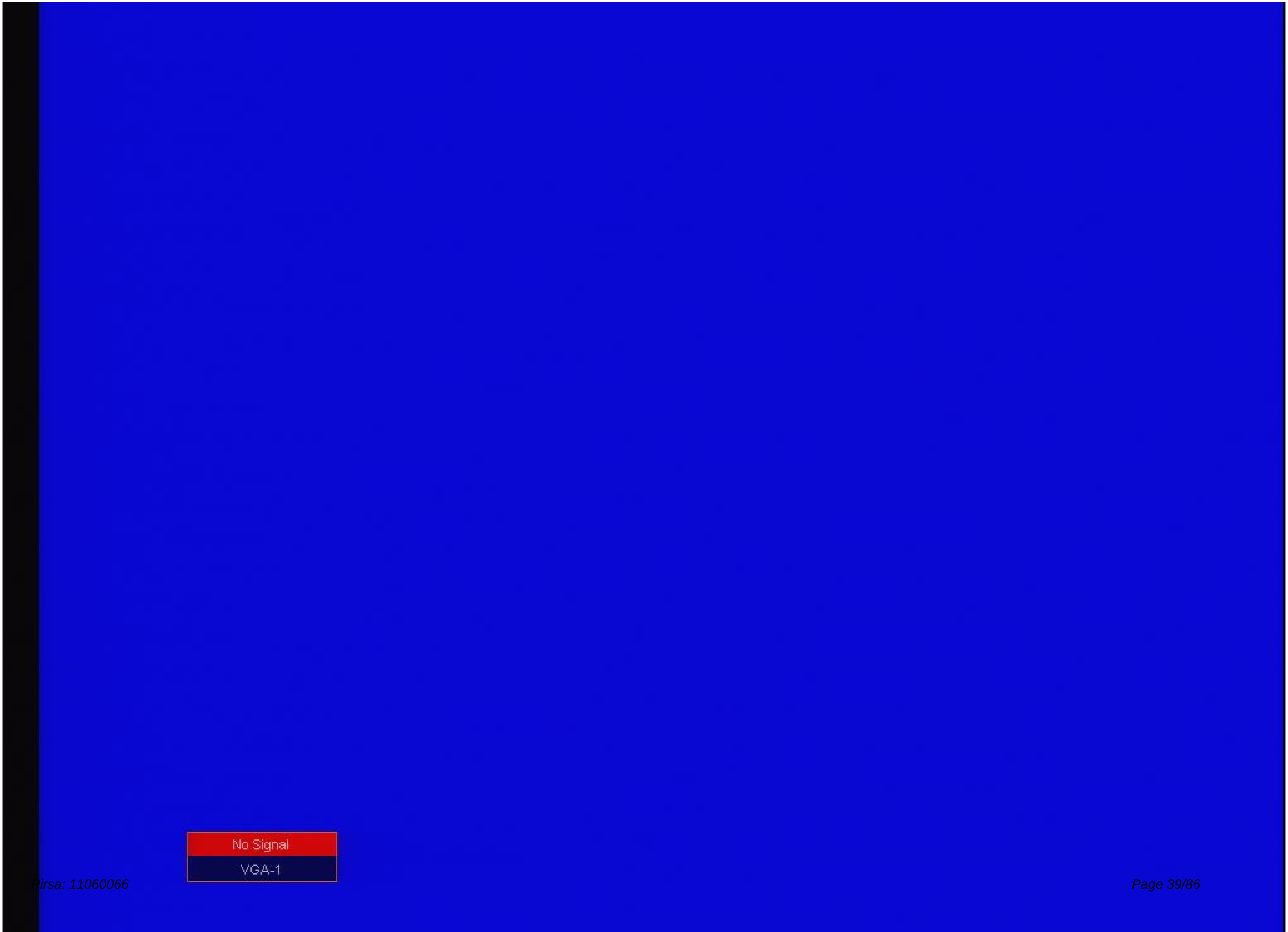

No Signal
VGA-1

No Signal
VGA-1


No Signal


No Signal
VGA-1

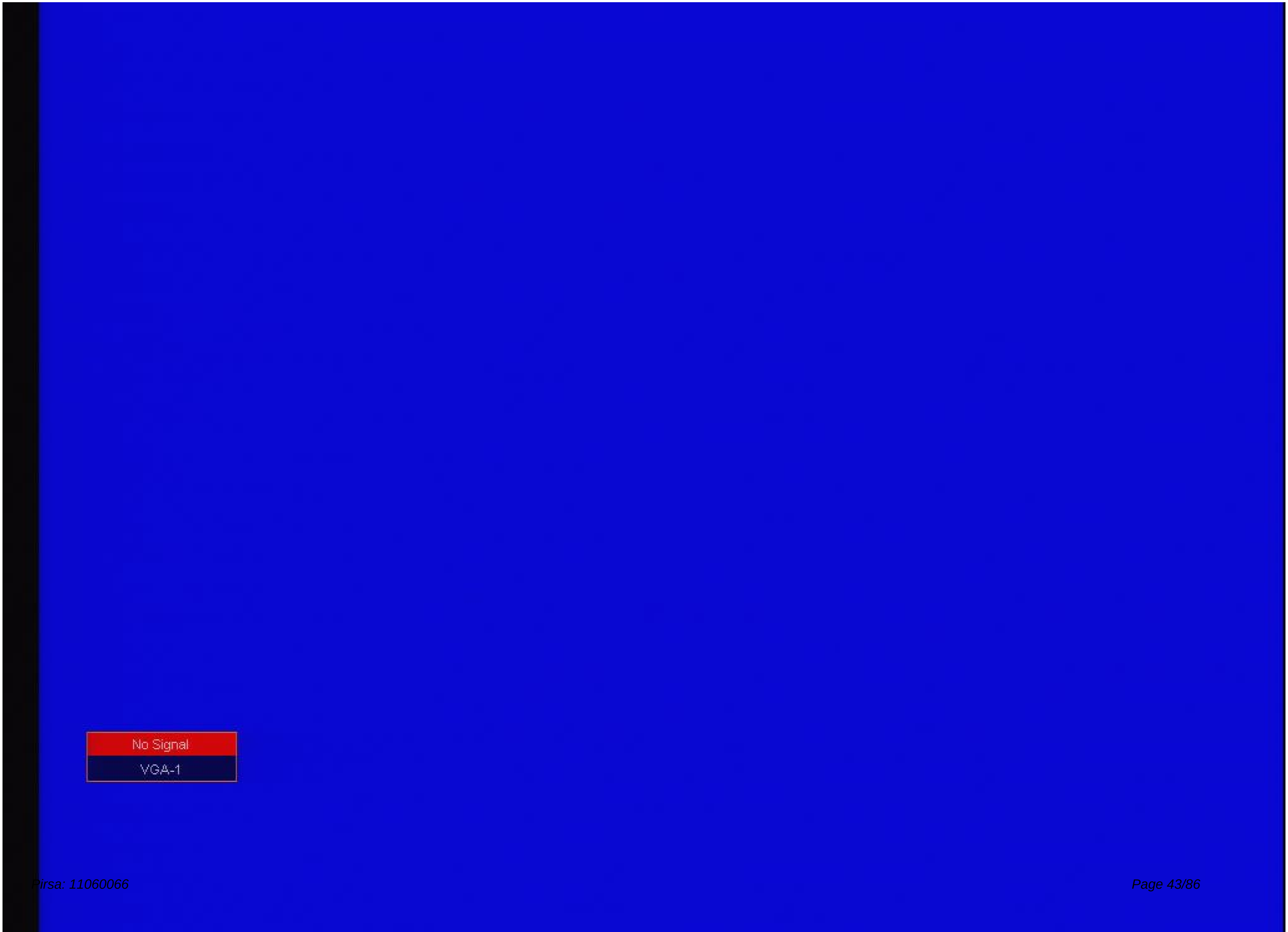

No Signal
VGA-1


No Signal
VGA-1

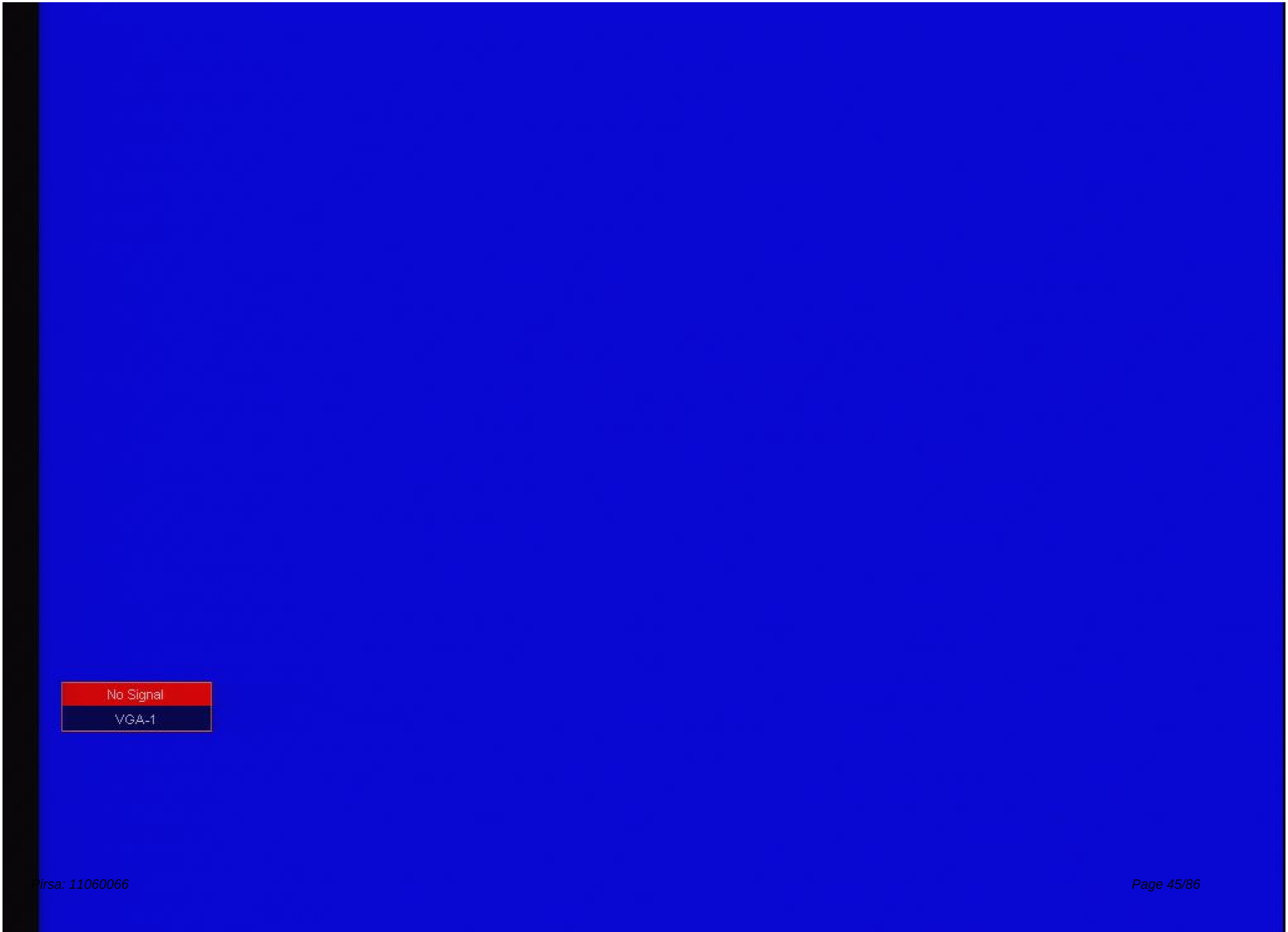
No Signal
VGA-1


No Signal
VGA-1

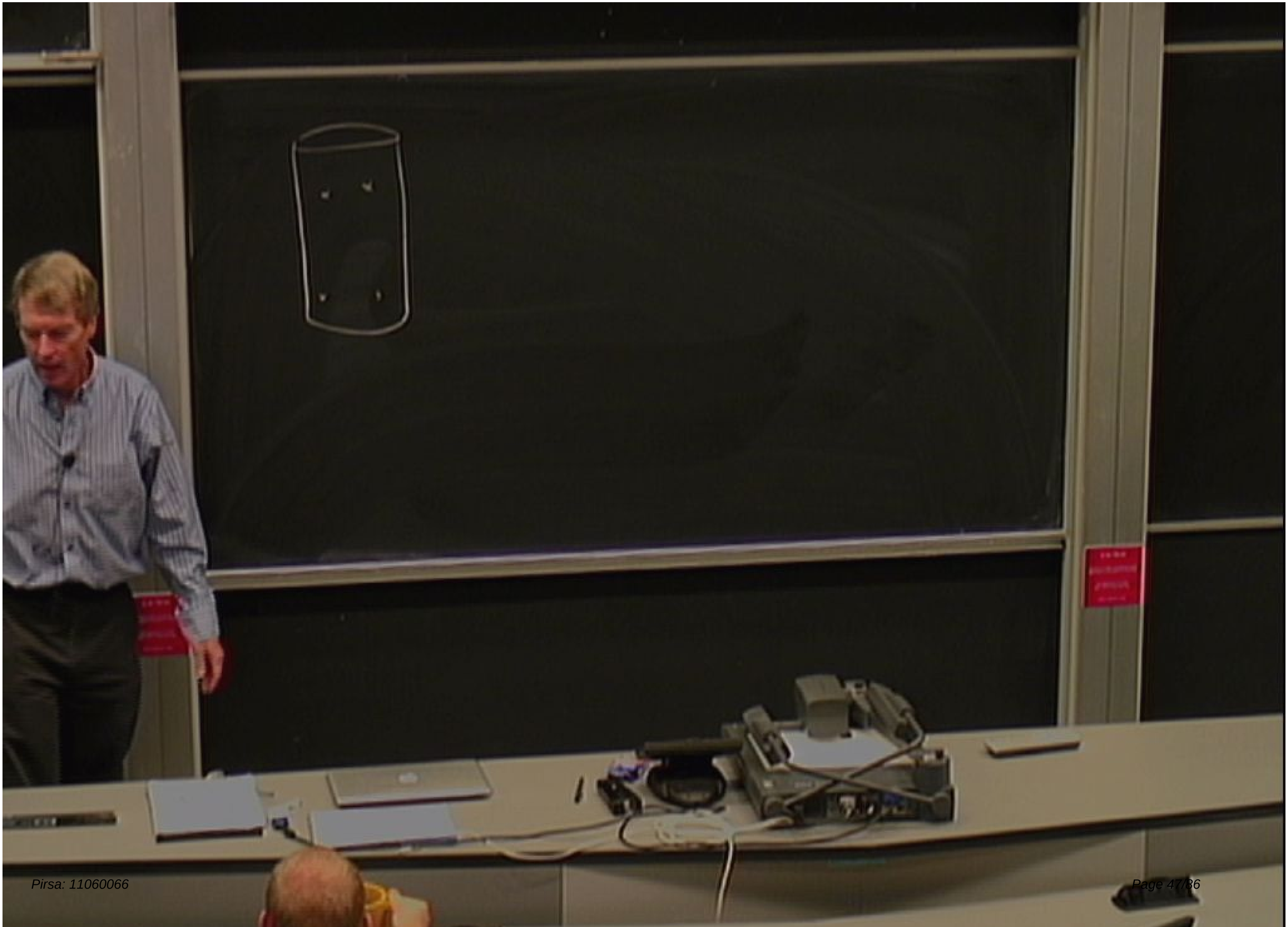
No Signal
VGA-1

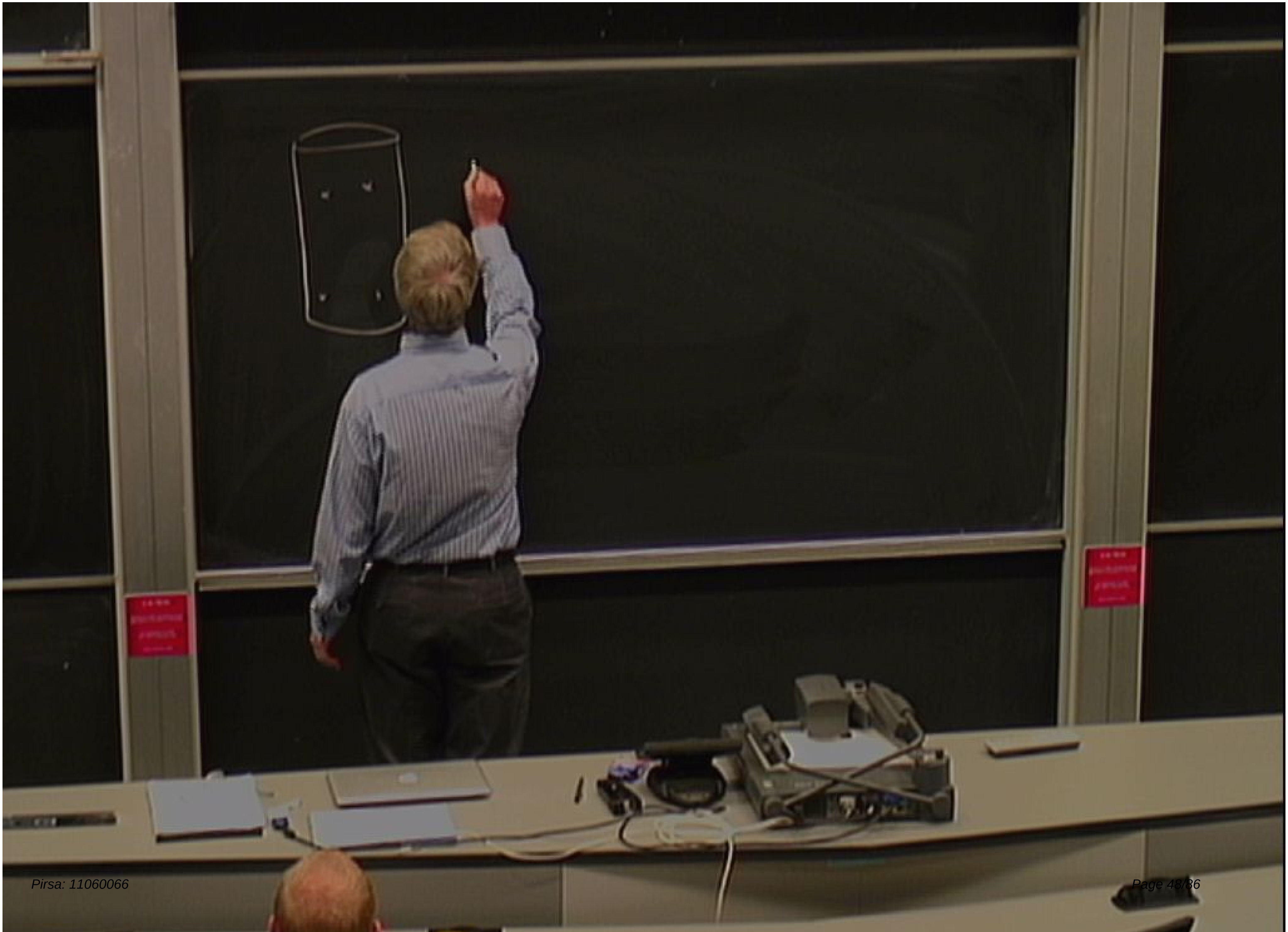

No Signal
VGA-1

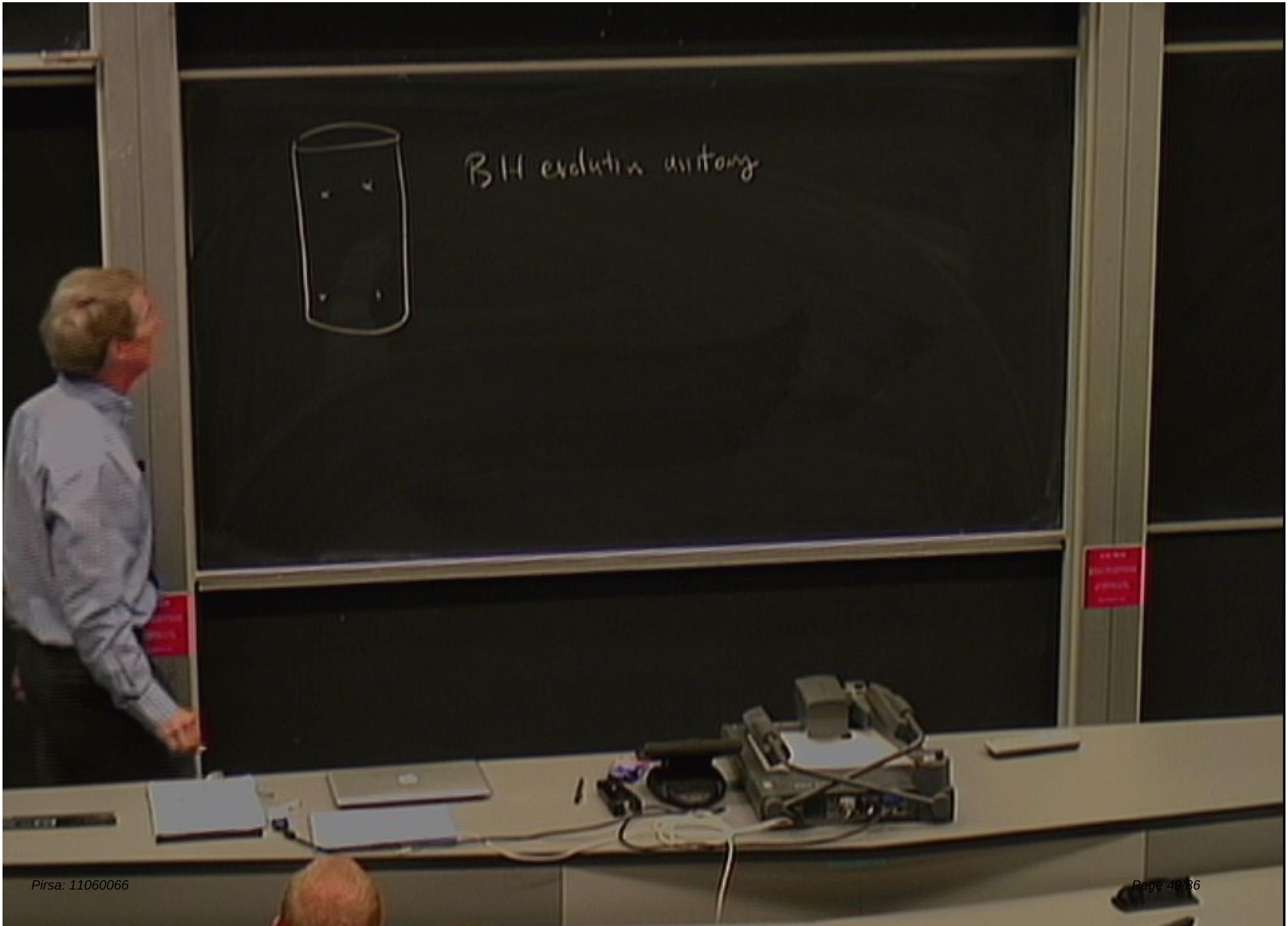
No Signal
VGA-1

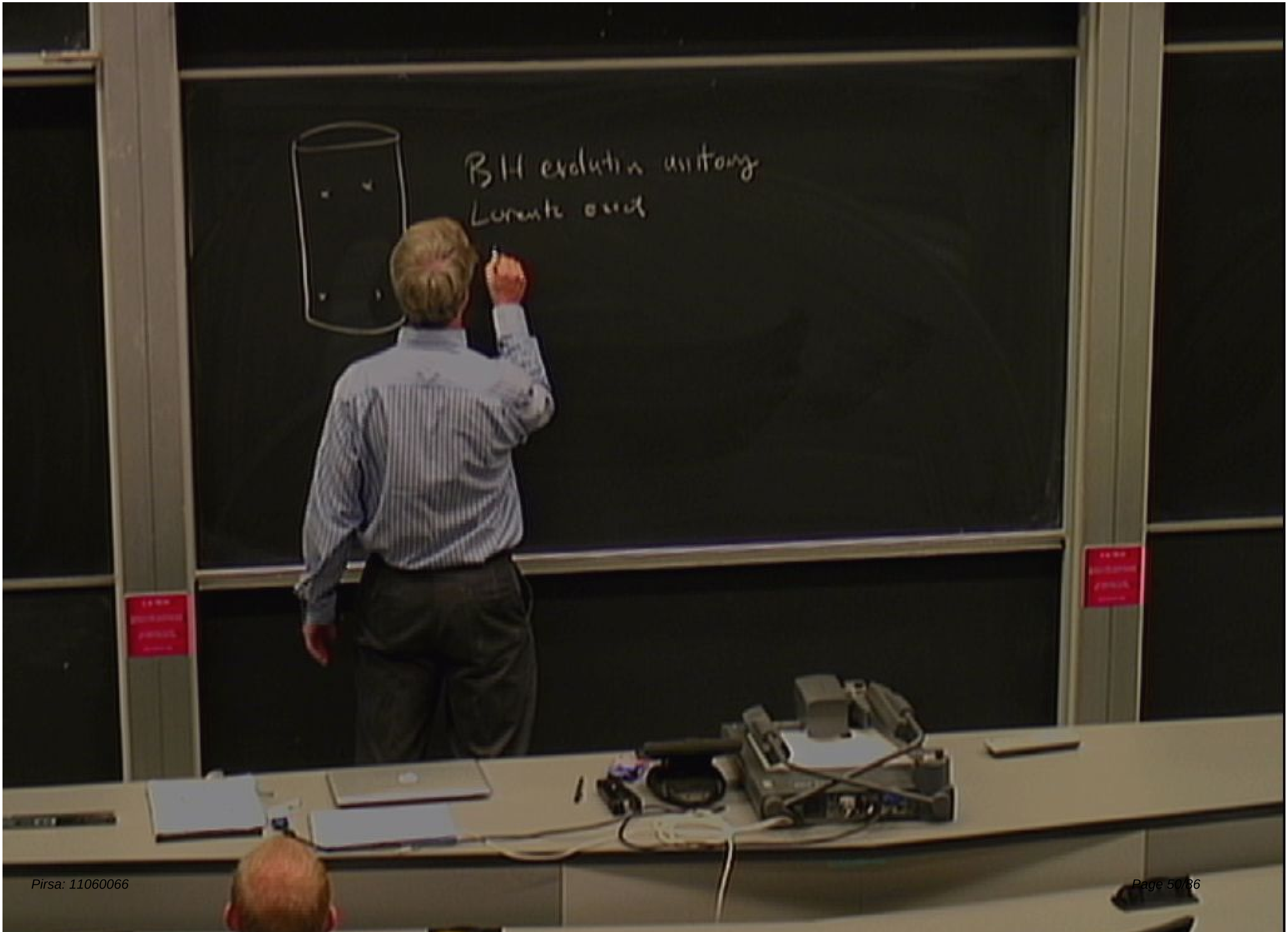

No Signal
VGA-1

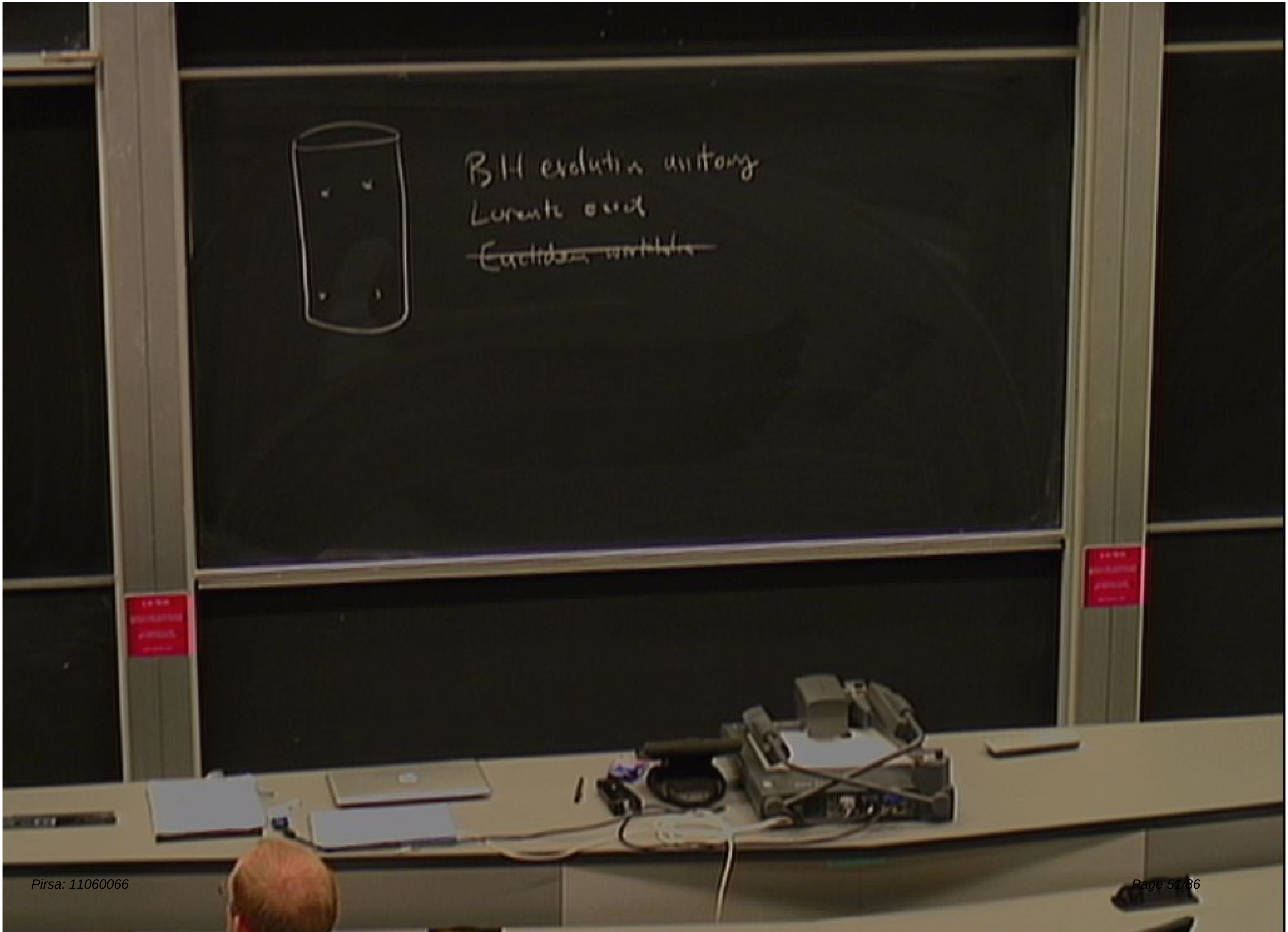

No Signal
VGA-1

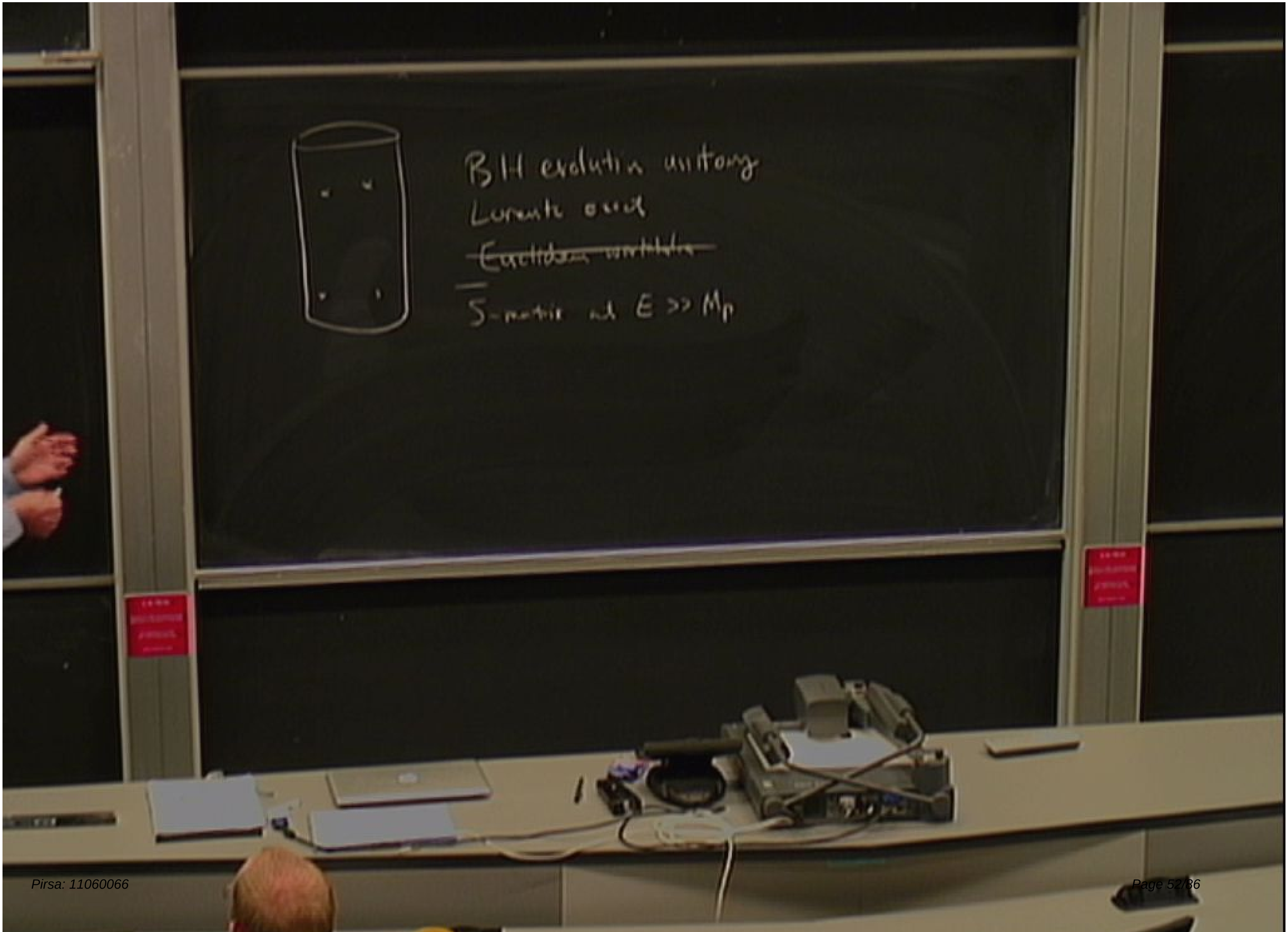


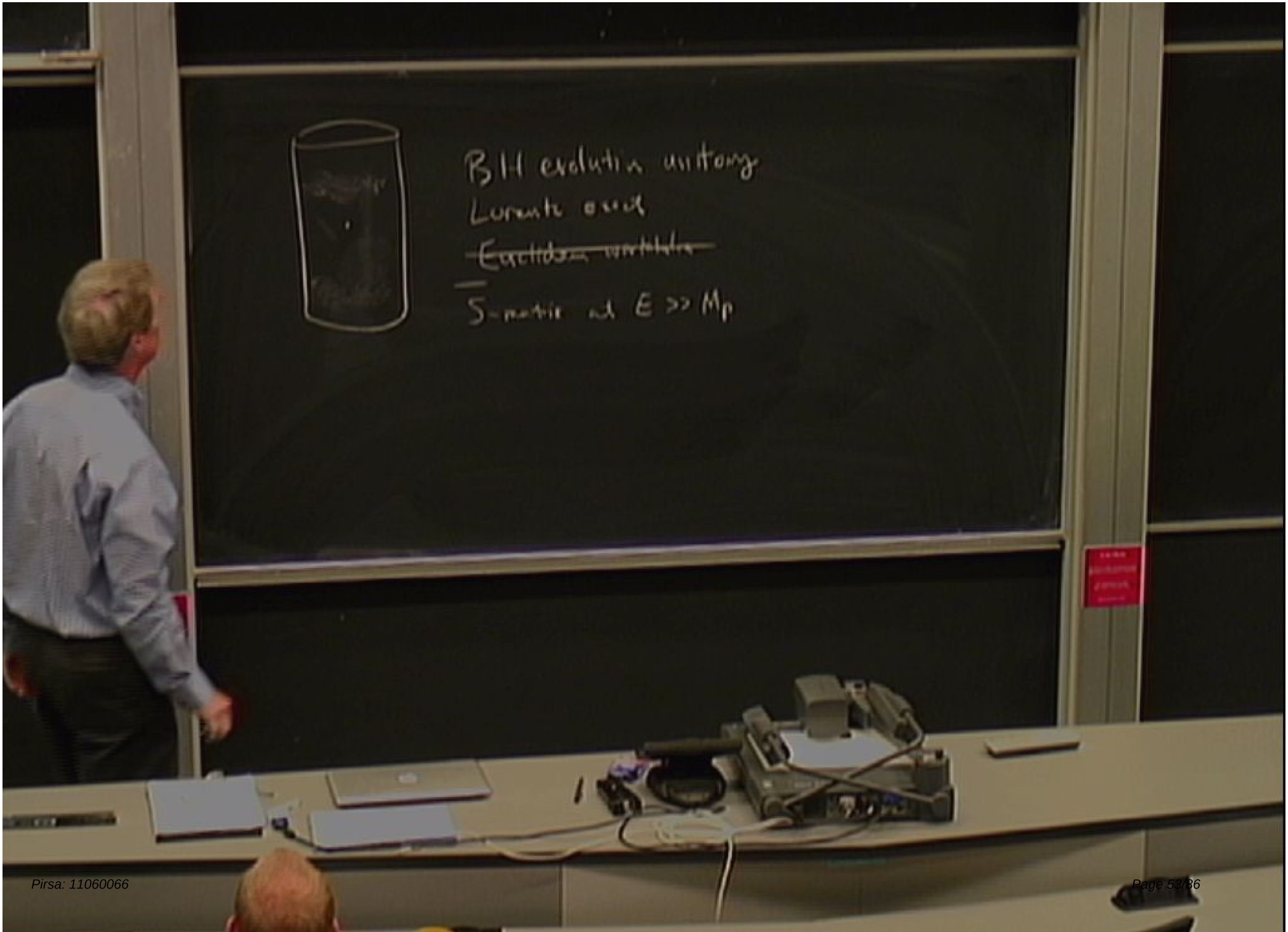


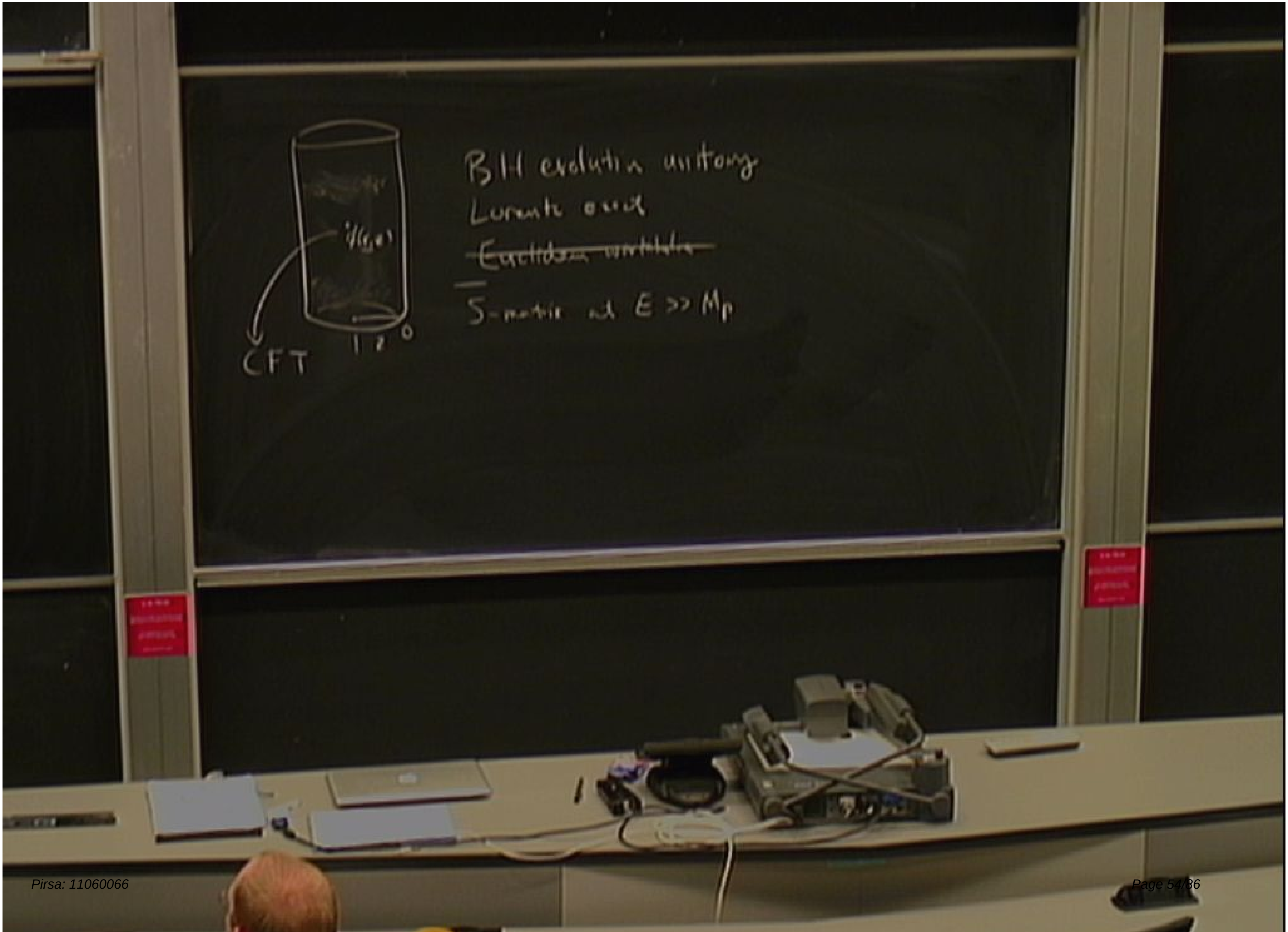

BH evolution unitary

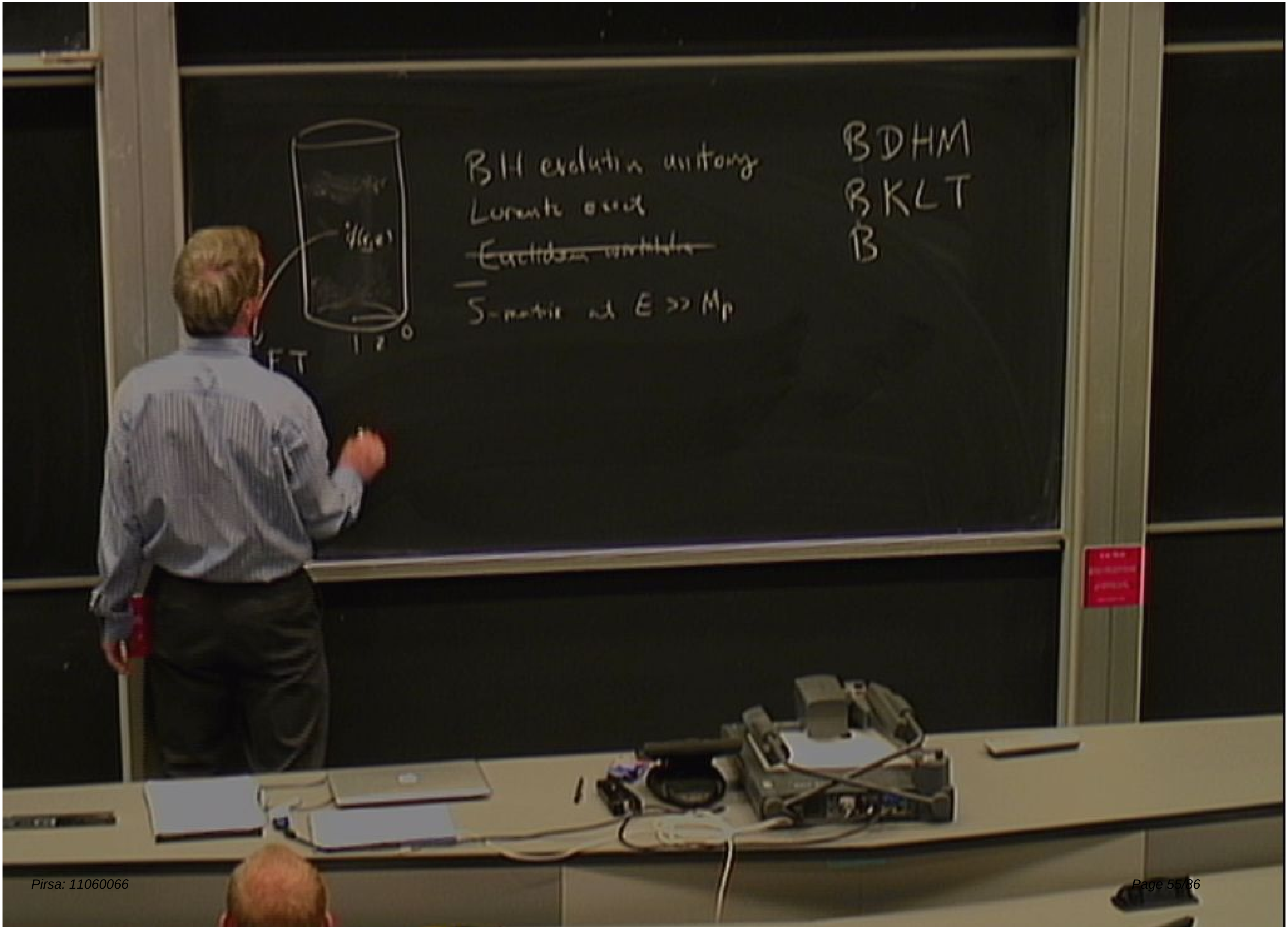

BH evolution unitary

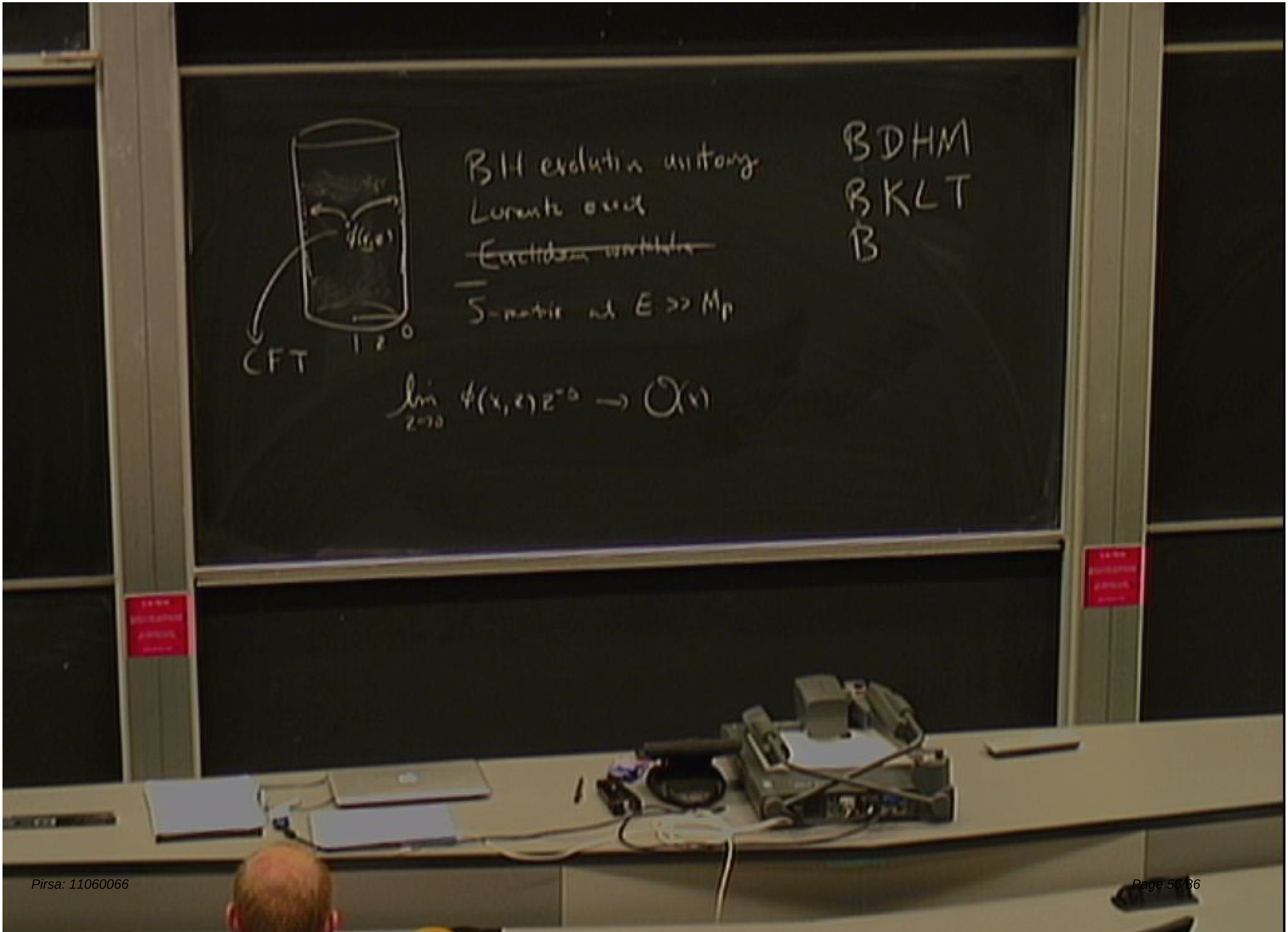

BH evolution unitary

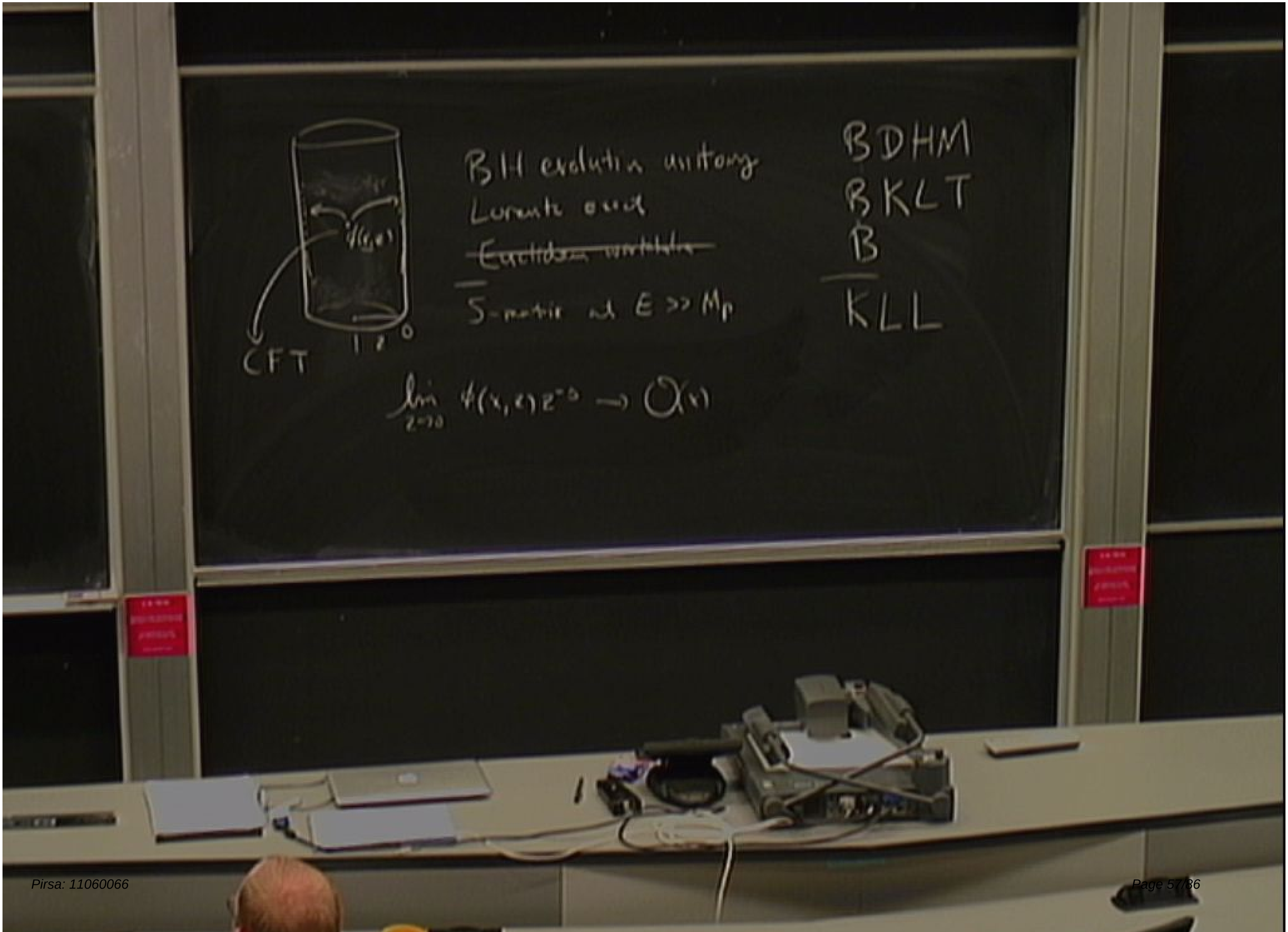

BH evolution unitary
Lorentz exact
S-matrix at E >> Mp

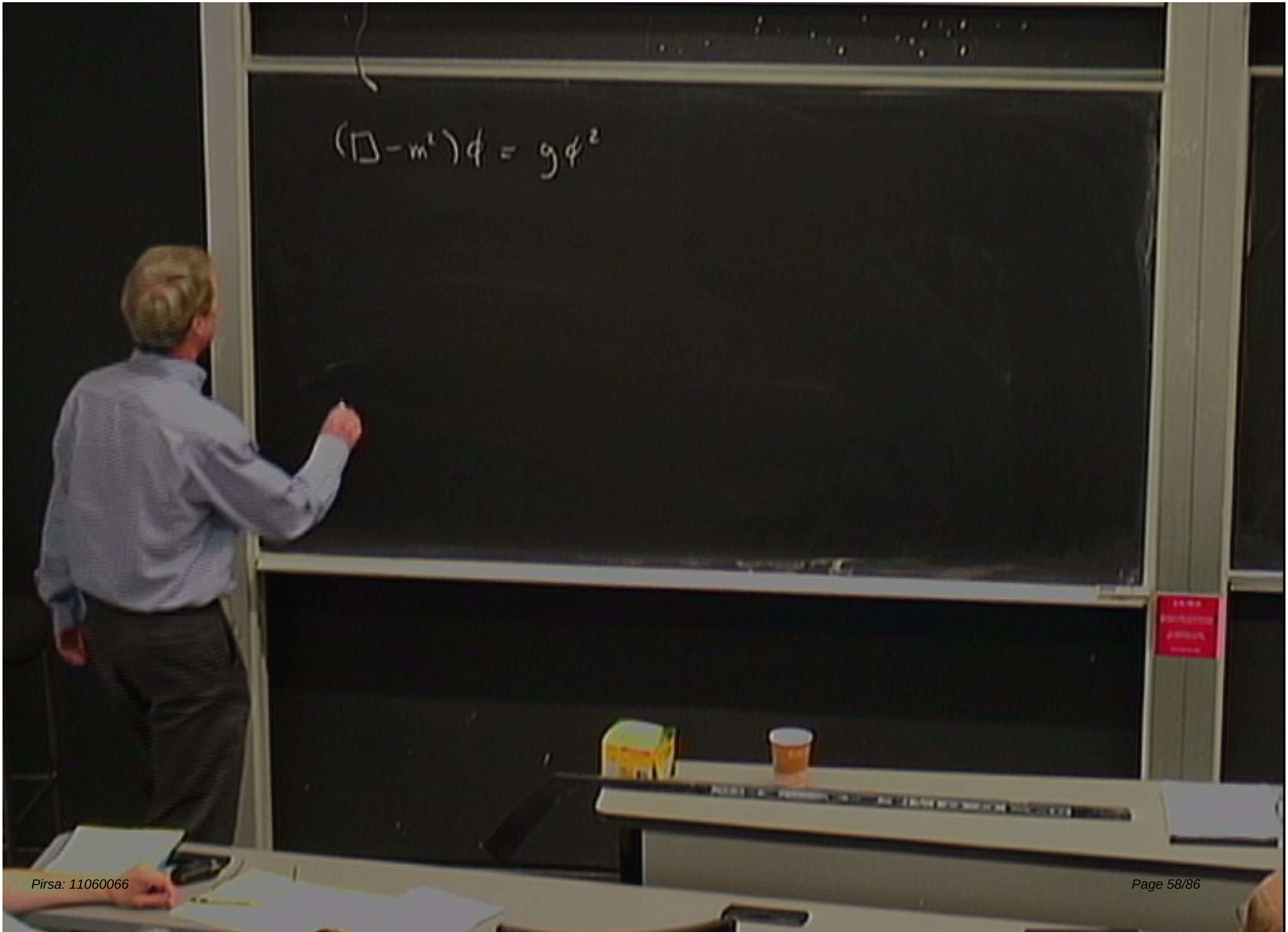

BH evolution unitary
Lorentz exact
S-matrix at E >> Mp

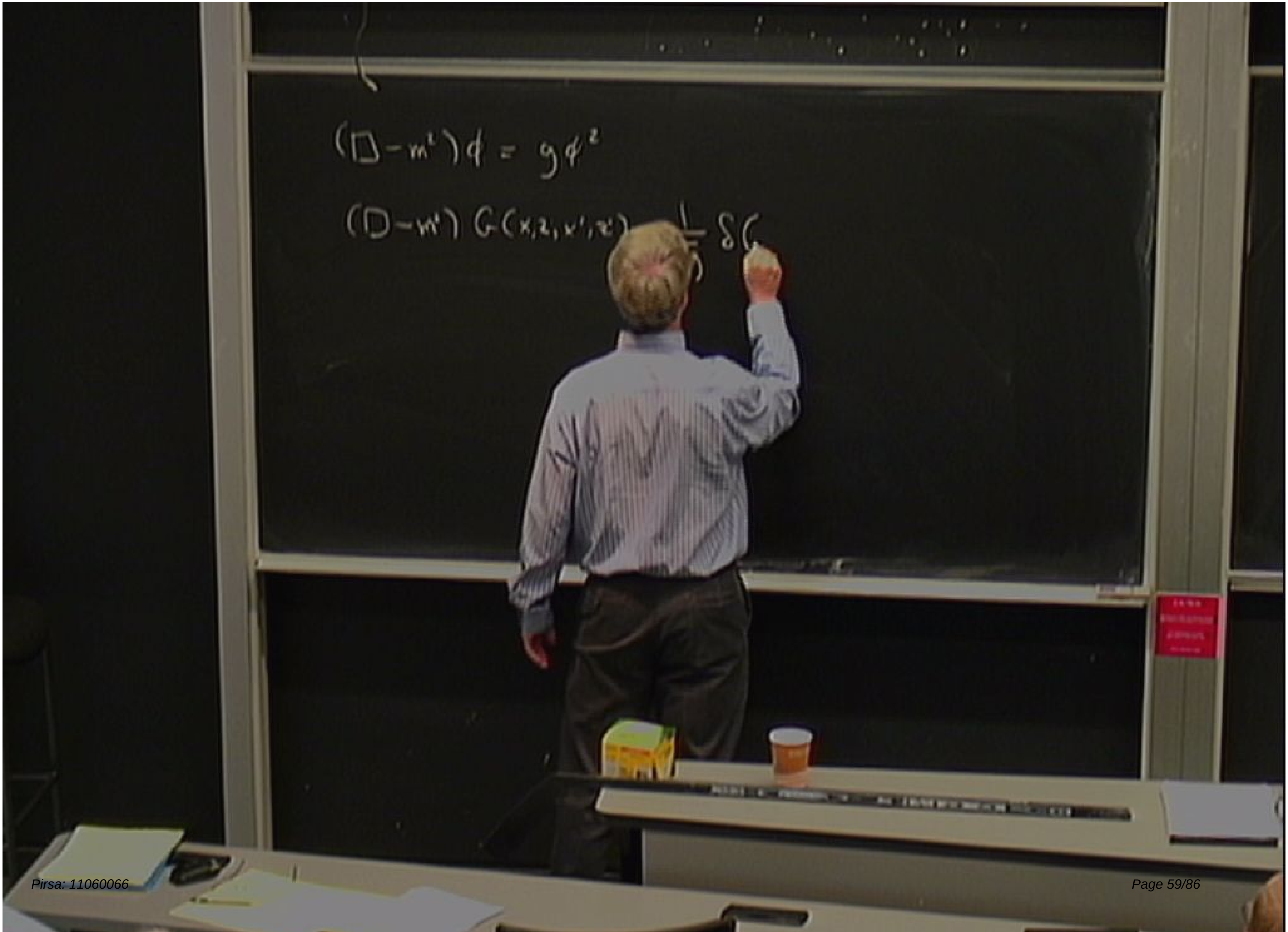

BH evolution unitary
Lorentz exact
S-matrix at E >> Mp
CFT

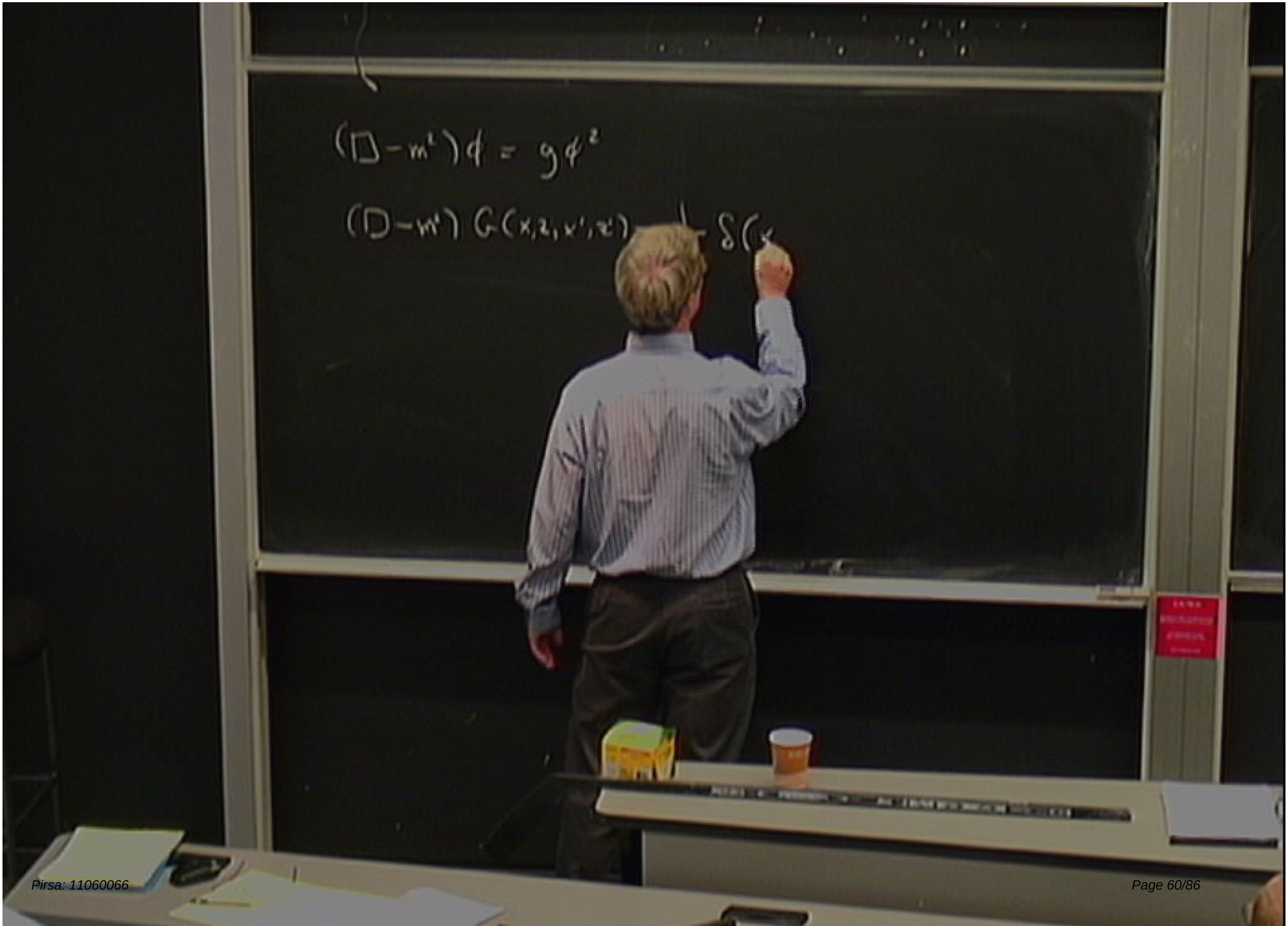

BDHM
BKLT
B

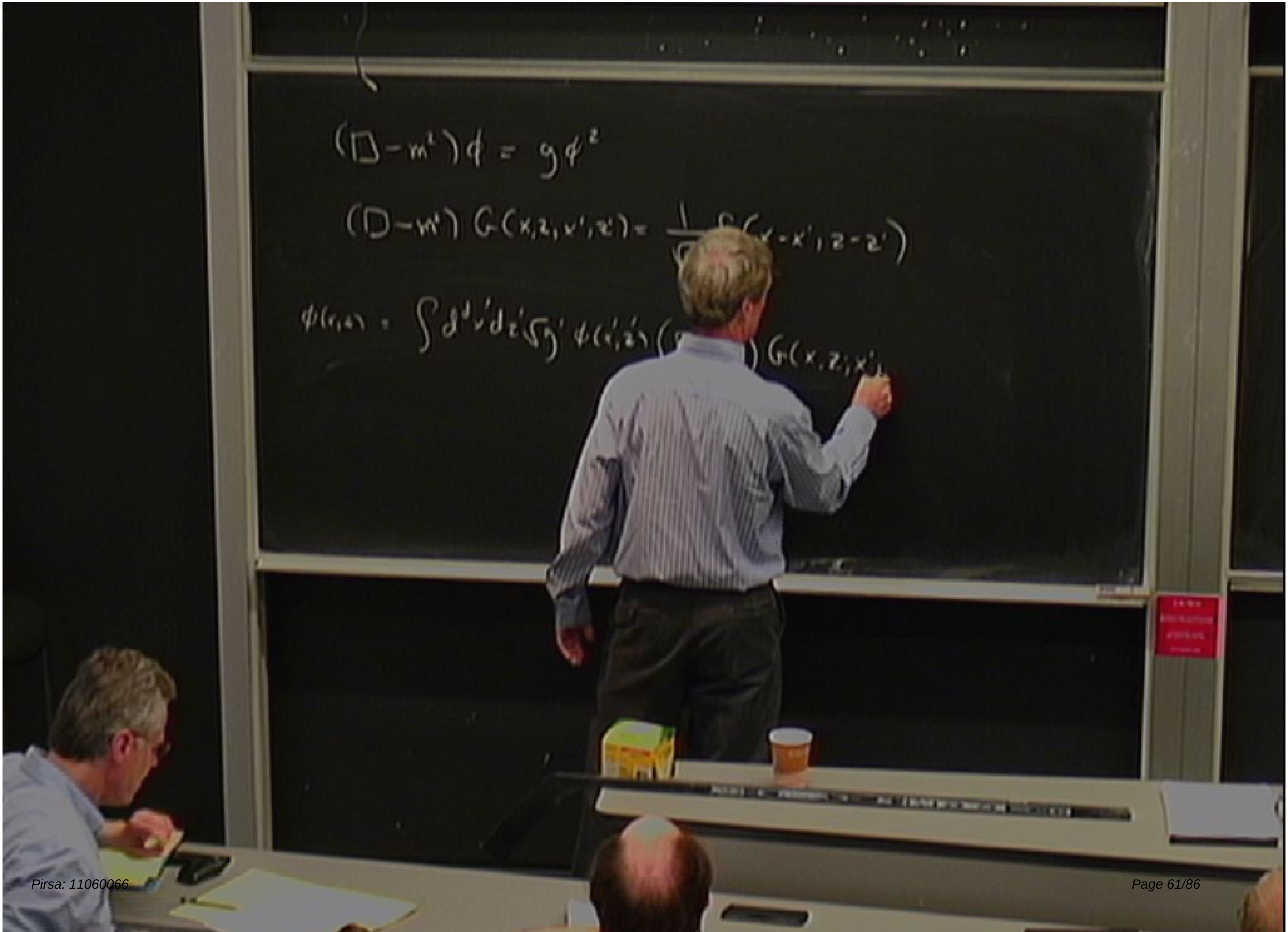

BDHM
BKLT
B
CFT
BH evolution unitary
S-matrix at E >> Mp

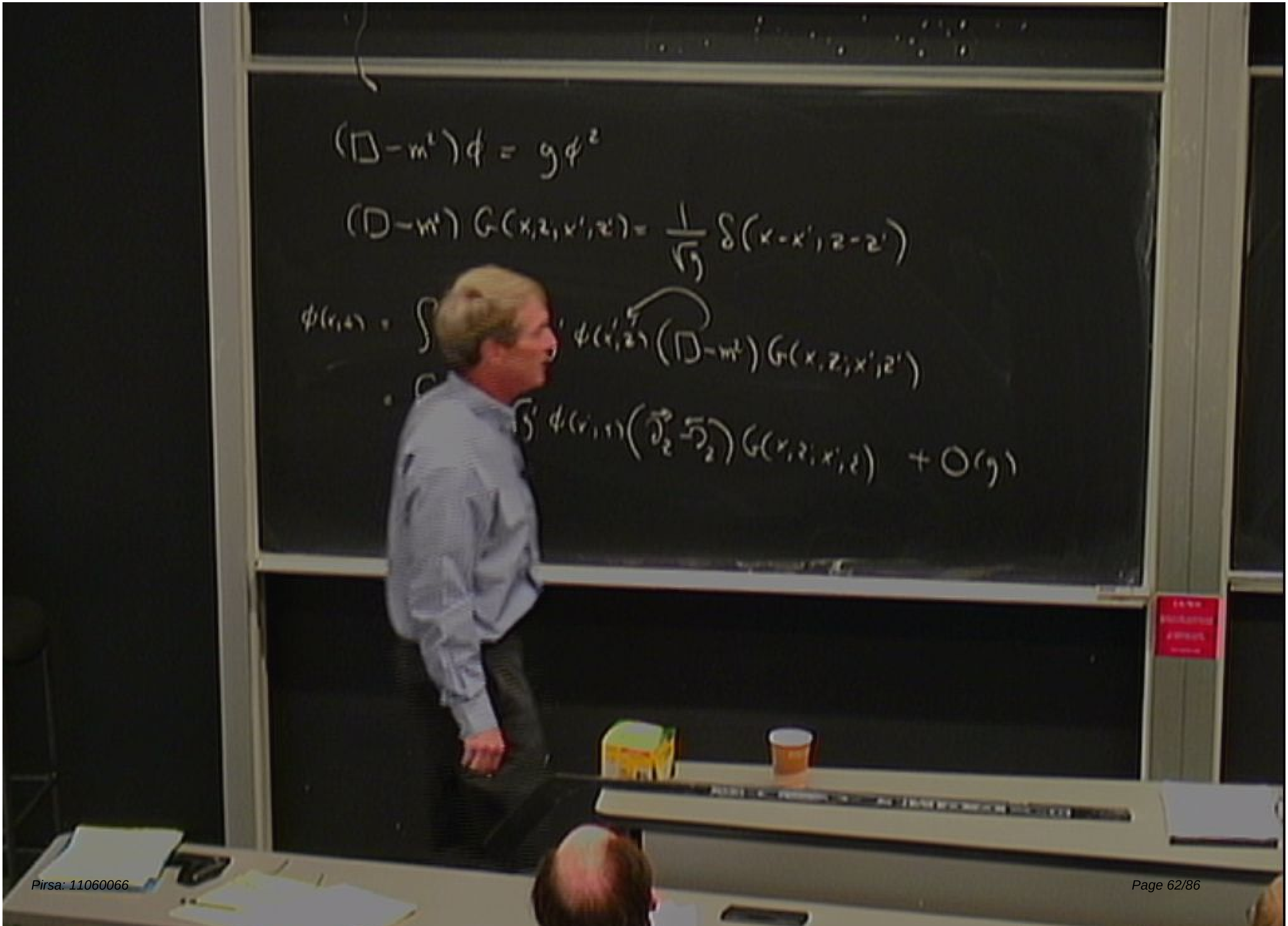

BH evolution unitary
S-matrix at E >> Mp
BDHM
BKLT
B
KLL
CFT

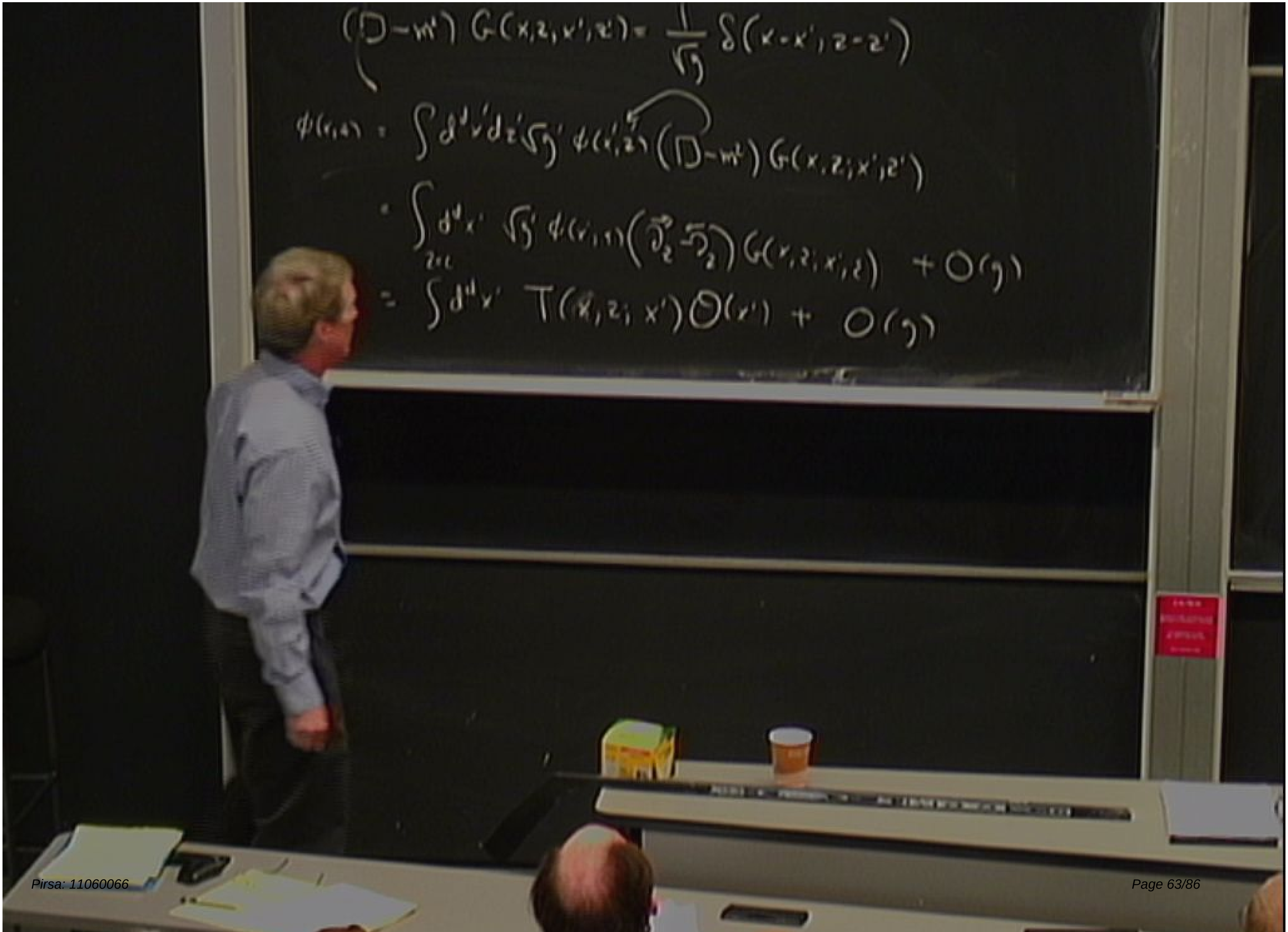

$(\Box - m^2)\phi = g\phi^2$

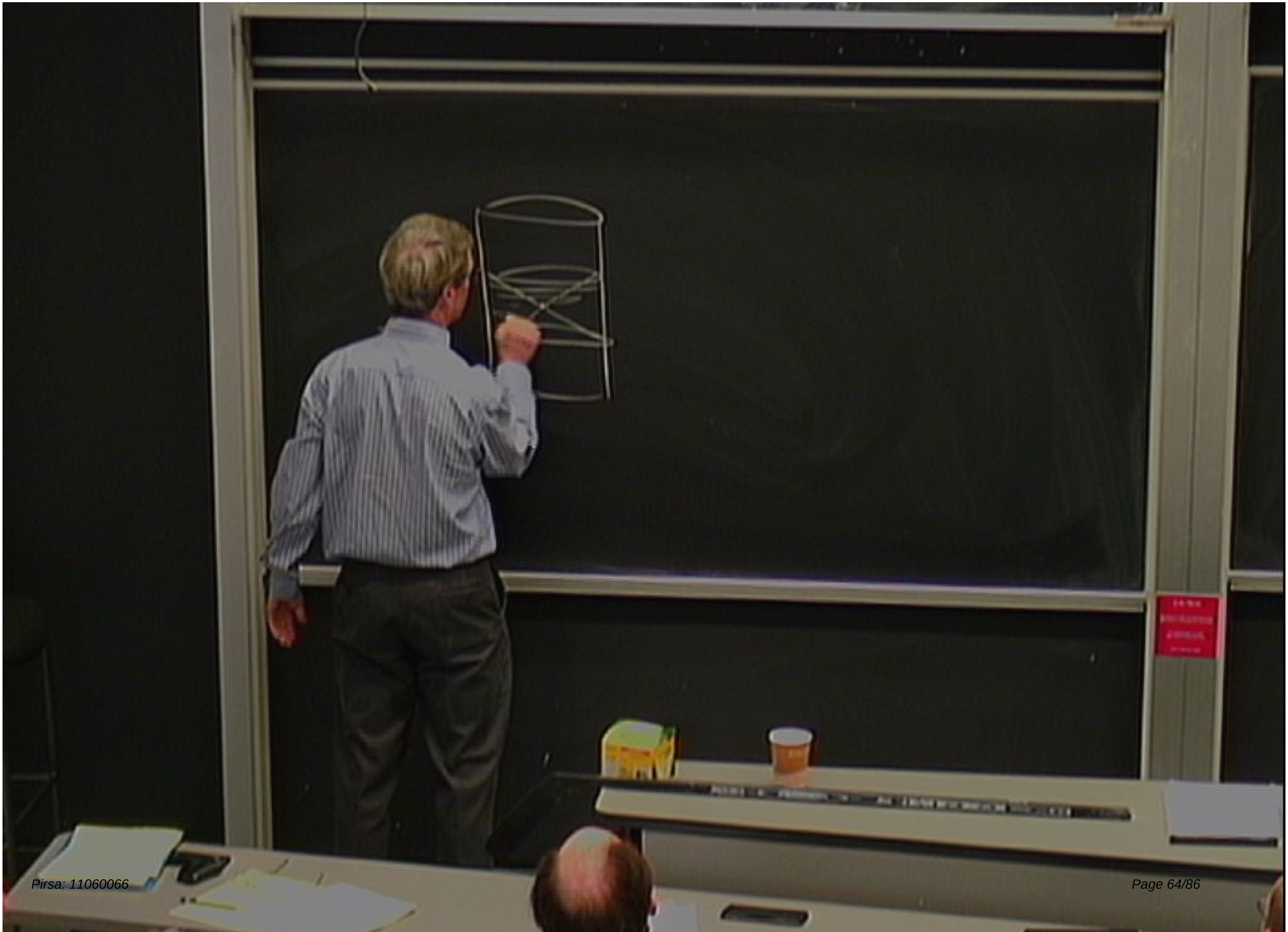

(□ − m²) φ = g φ²
(□ − m²) G(x, z, x′, z′)

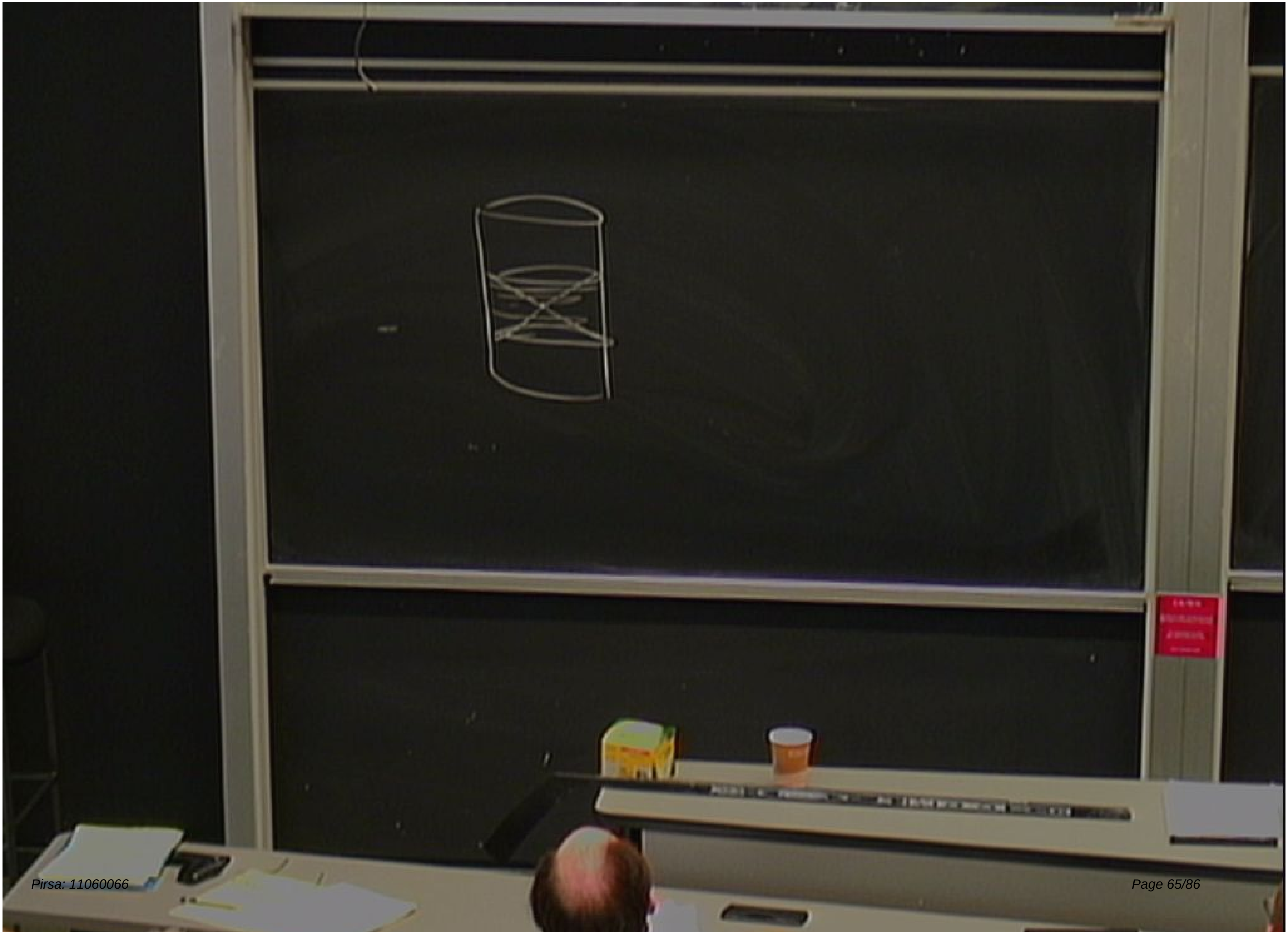

(□ − m²)φ = gφ²
(□ − m²) G(x,z,x′,z′)
δ(x

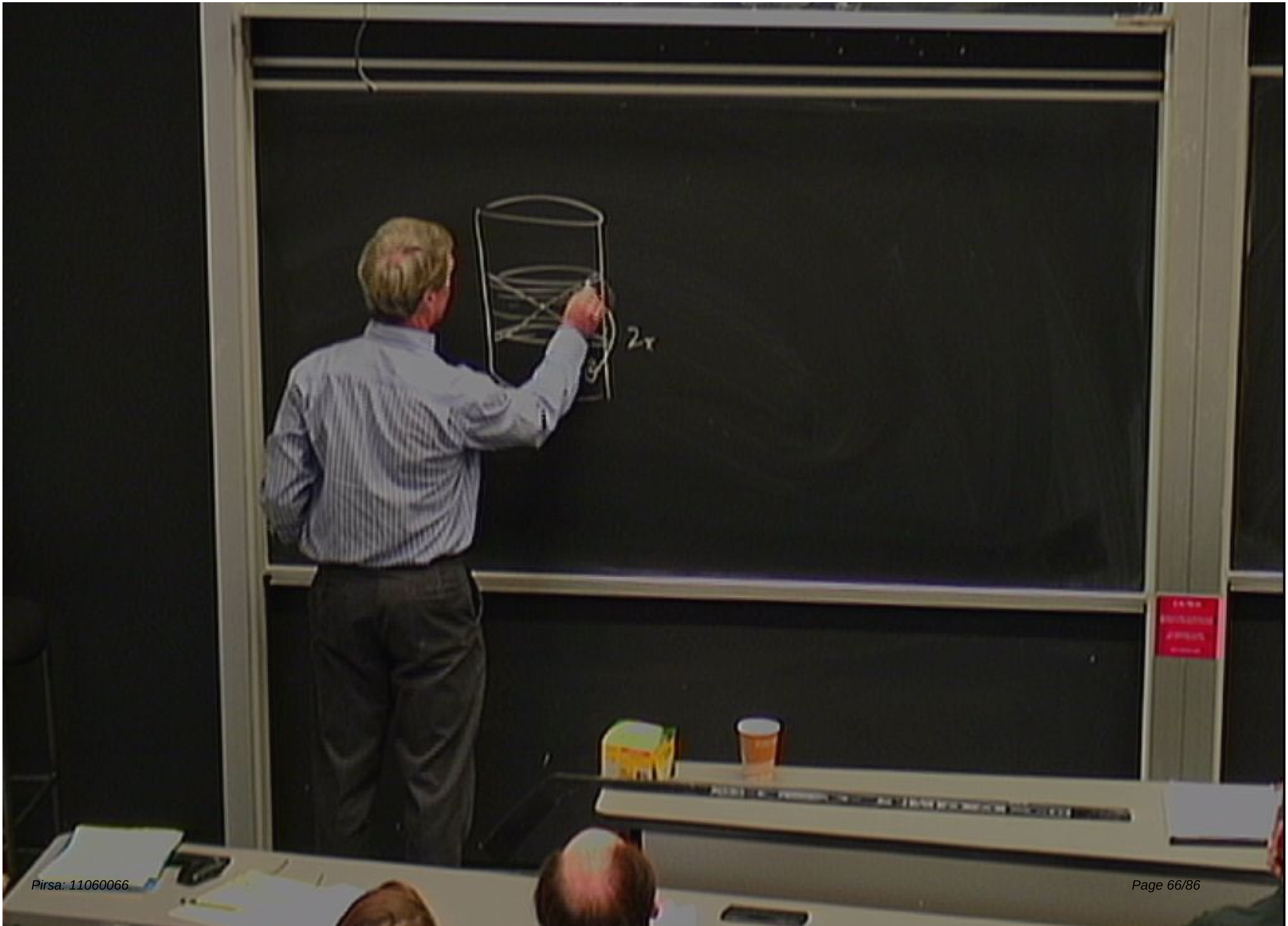

(□ − m²) φ = g φ²
(□ − m²) G(x,z,x',z') = 1/ (x − x', z − z')
φ(x,z) = ∫ dᵈx' dz' √g' φ(x',z') ( ) G(x, z; x'

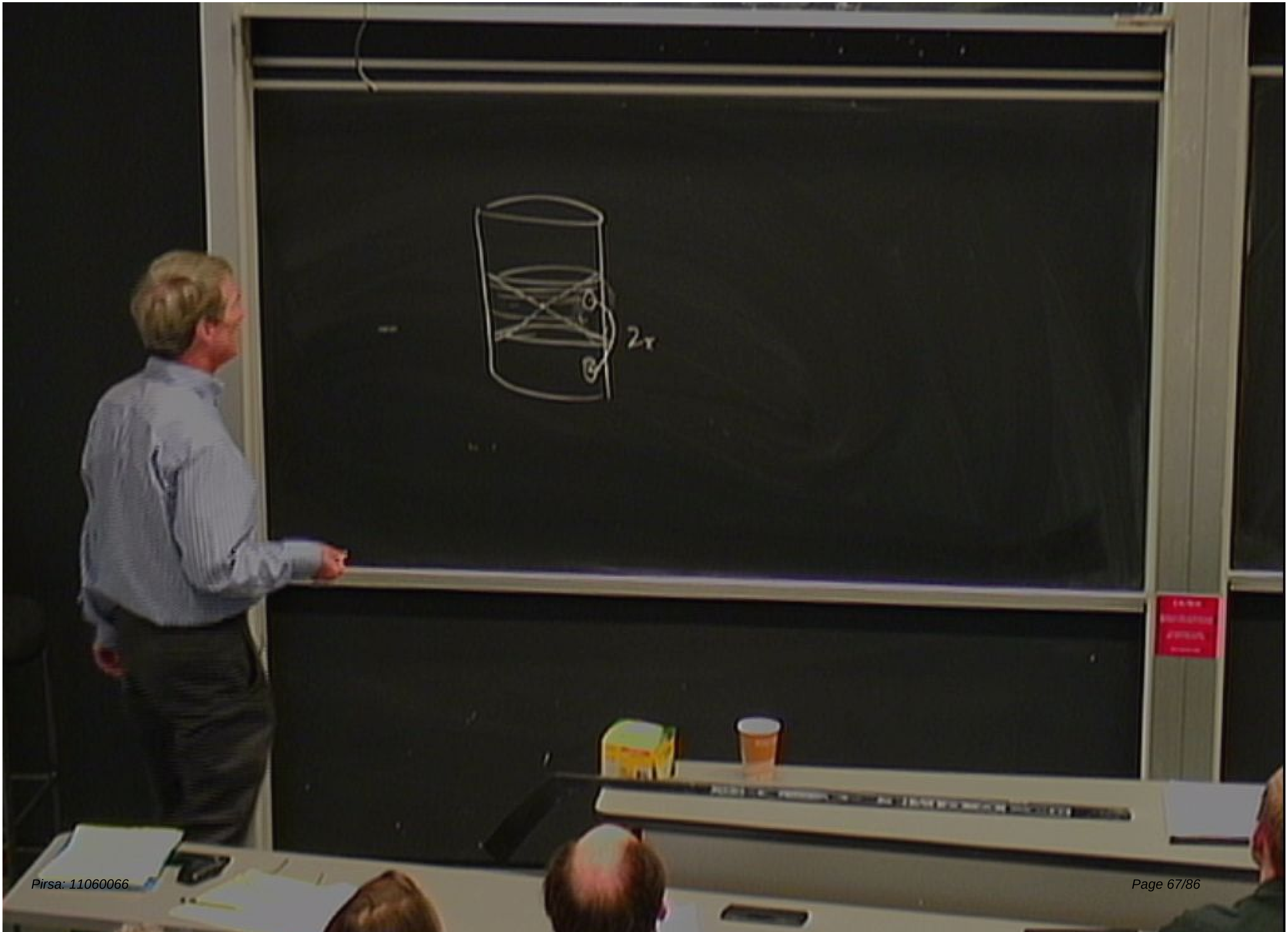

(□ − m²)φ = gφ²
(□ − m²) G(x,z;x',z') = 1/√g δ(x − x', z − z')
φ(x,z) = ∫ φ(x',z') (□ − m²) G(x,z;x',z')
φ(x',z') (∂⃗_z − ∂⃖_z) G(x,z;x',z) + O(g)

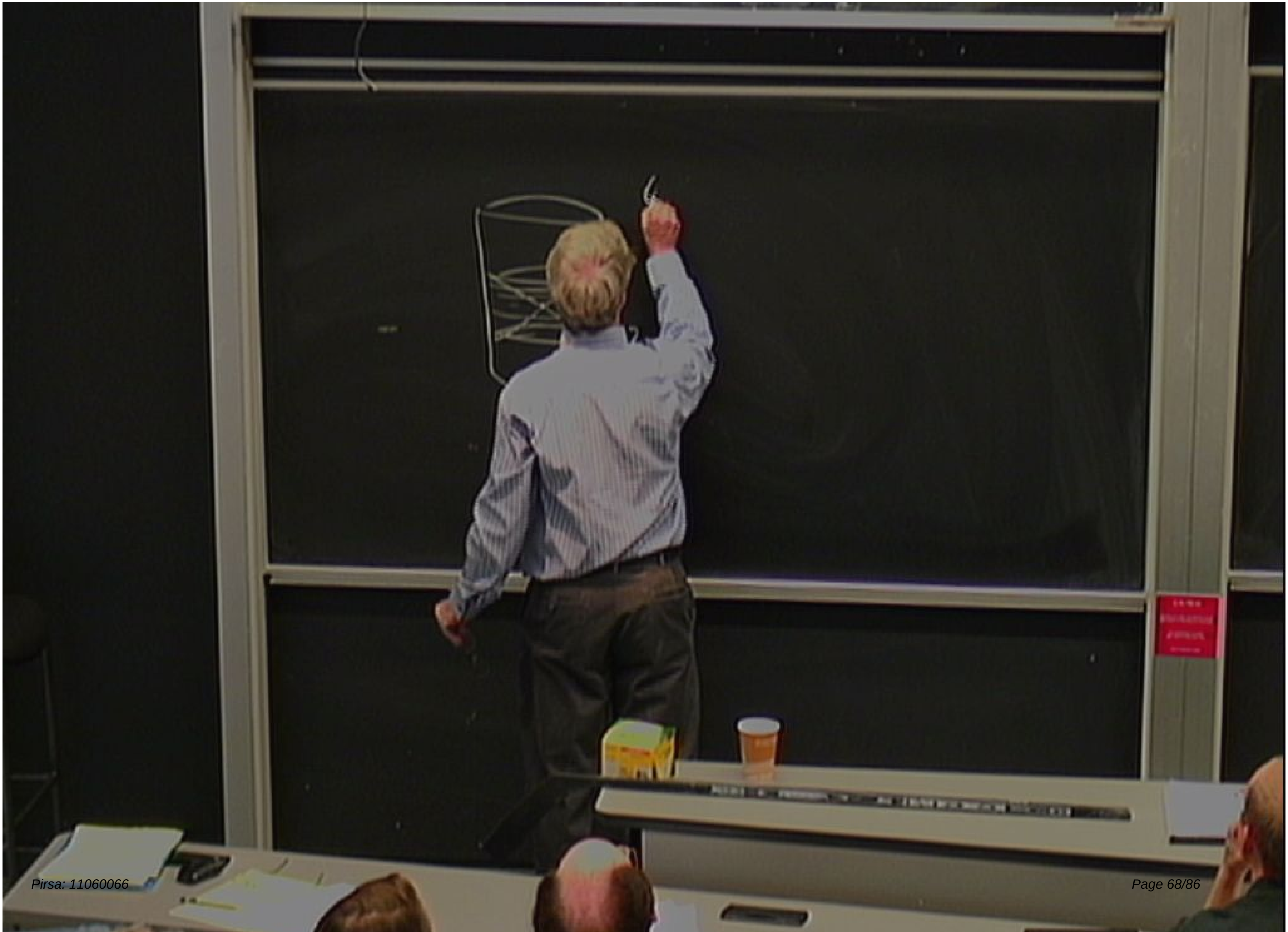

(□ − m²) G(x,z;x',z') = 1/√g δ(x − x', z − z')
φ(x,z) = ∫ d^d x' dz' √g' φ(x',z') (□ − m²) G(x,z;x',z')
= ∫_{z=ε} d^d x' √g' φ(x',ε) (∂_z − ∂_z) G(x,z;x',ε) + O(g)
= ∫ d^d x' T(x,z;x') O(x') + O(g)

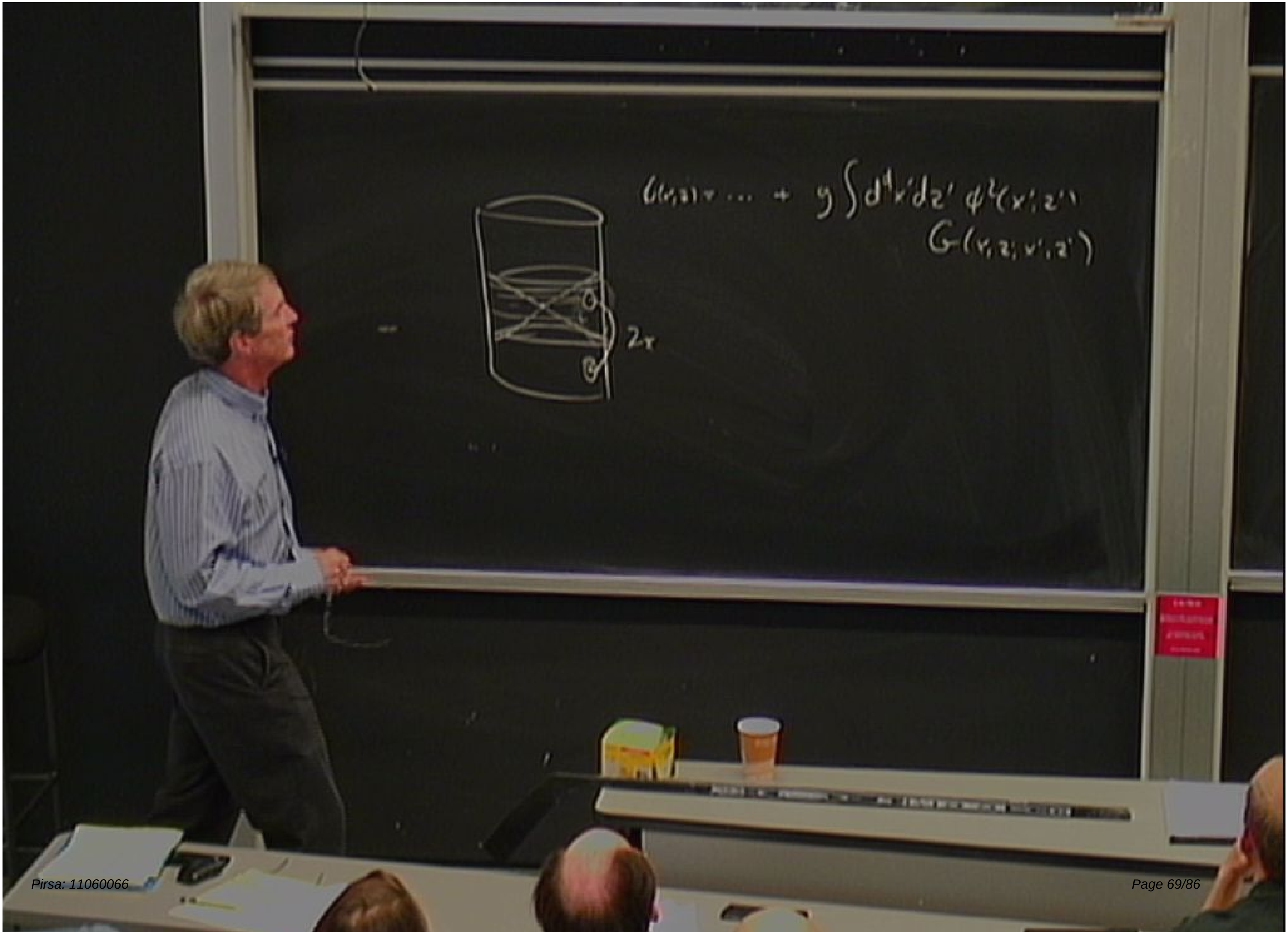


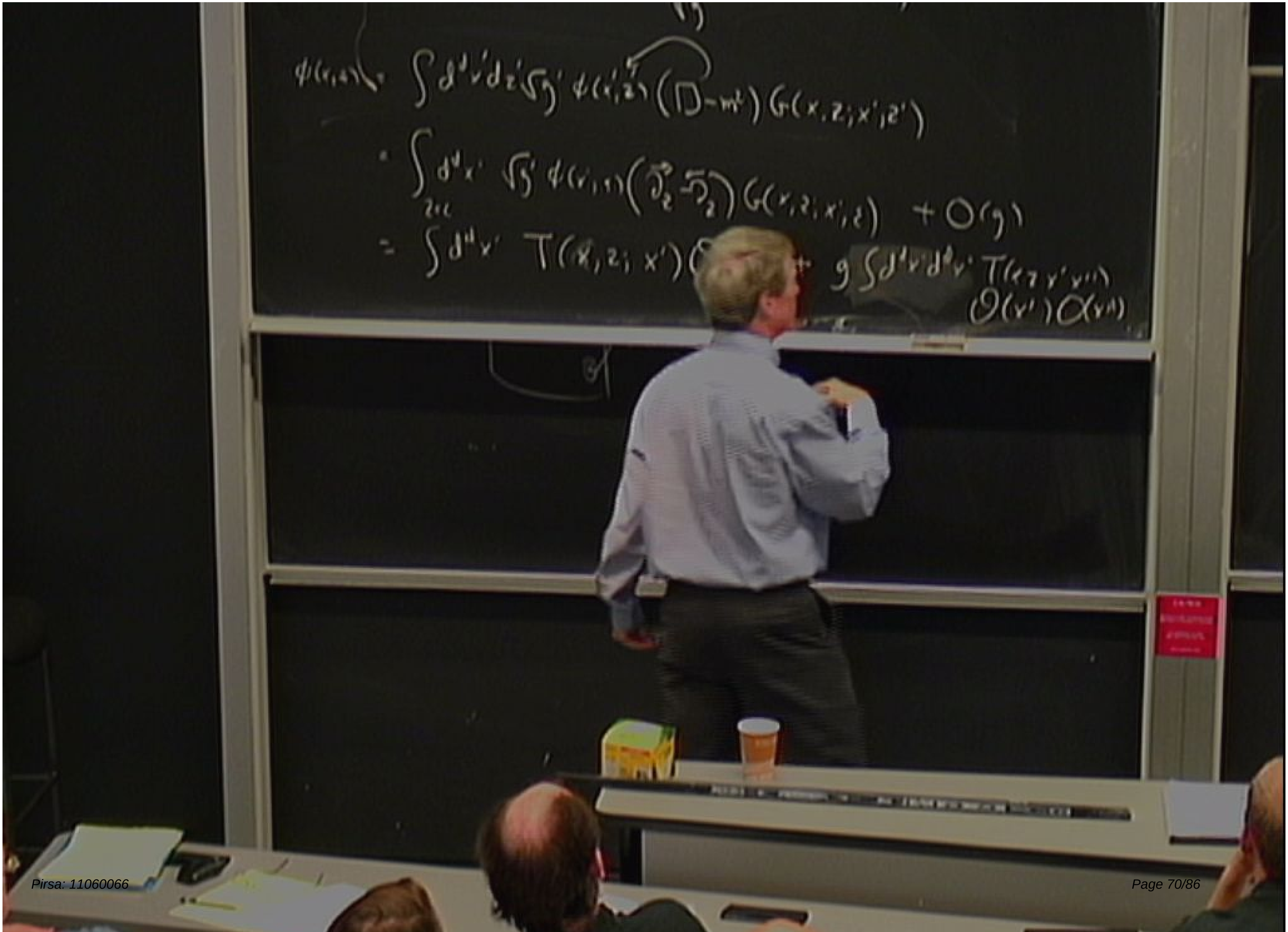


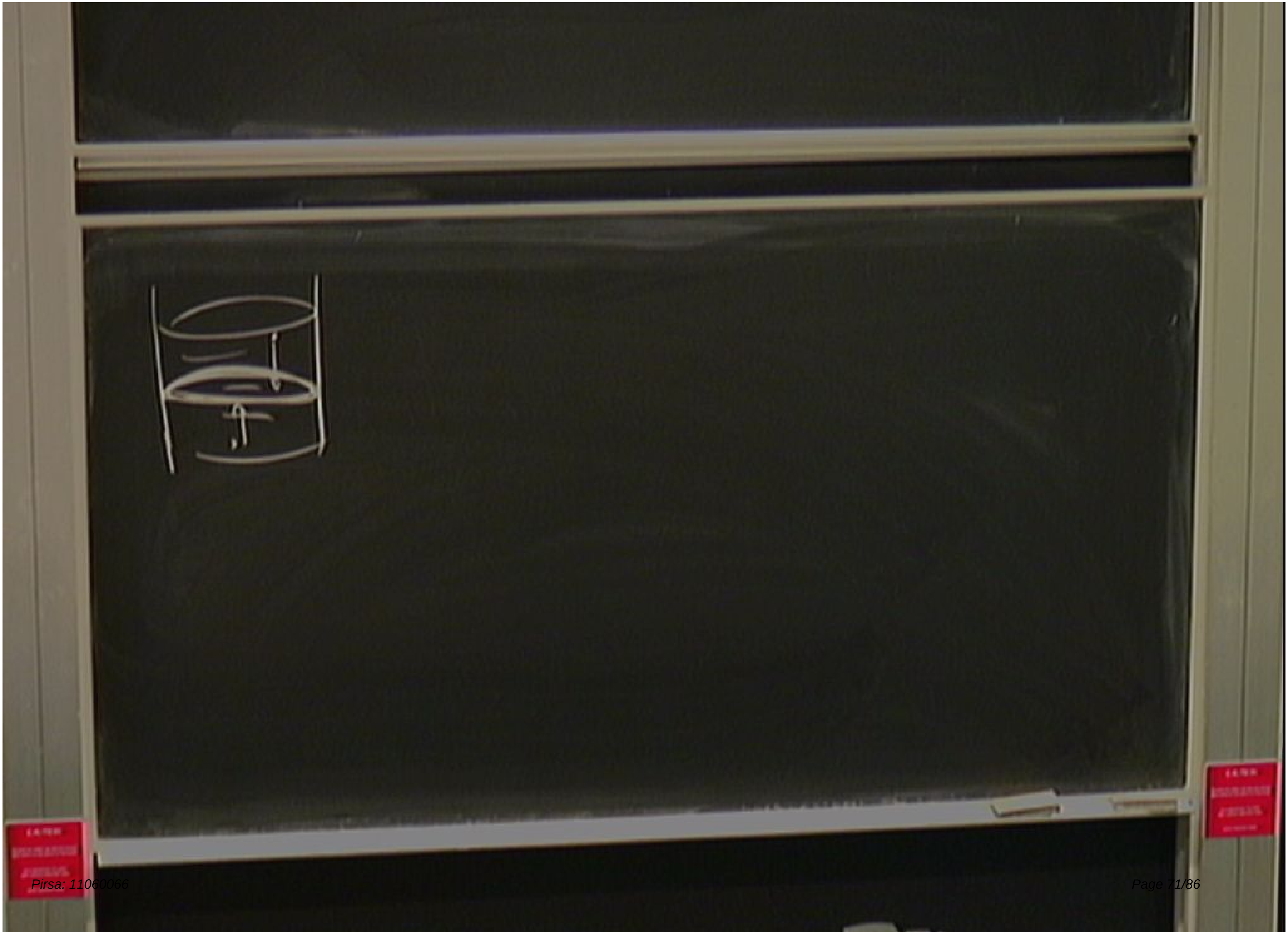

2π

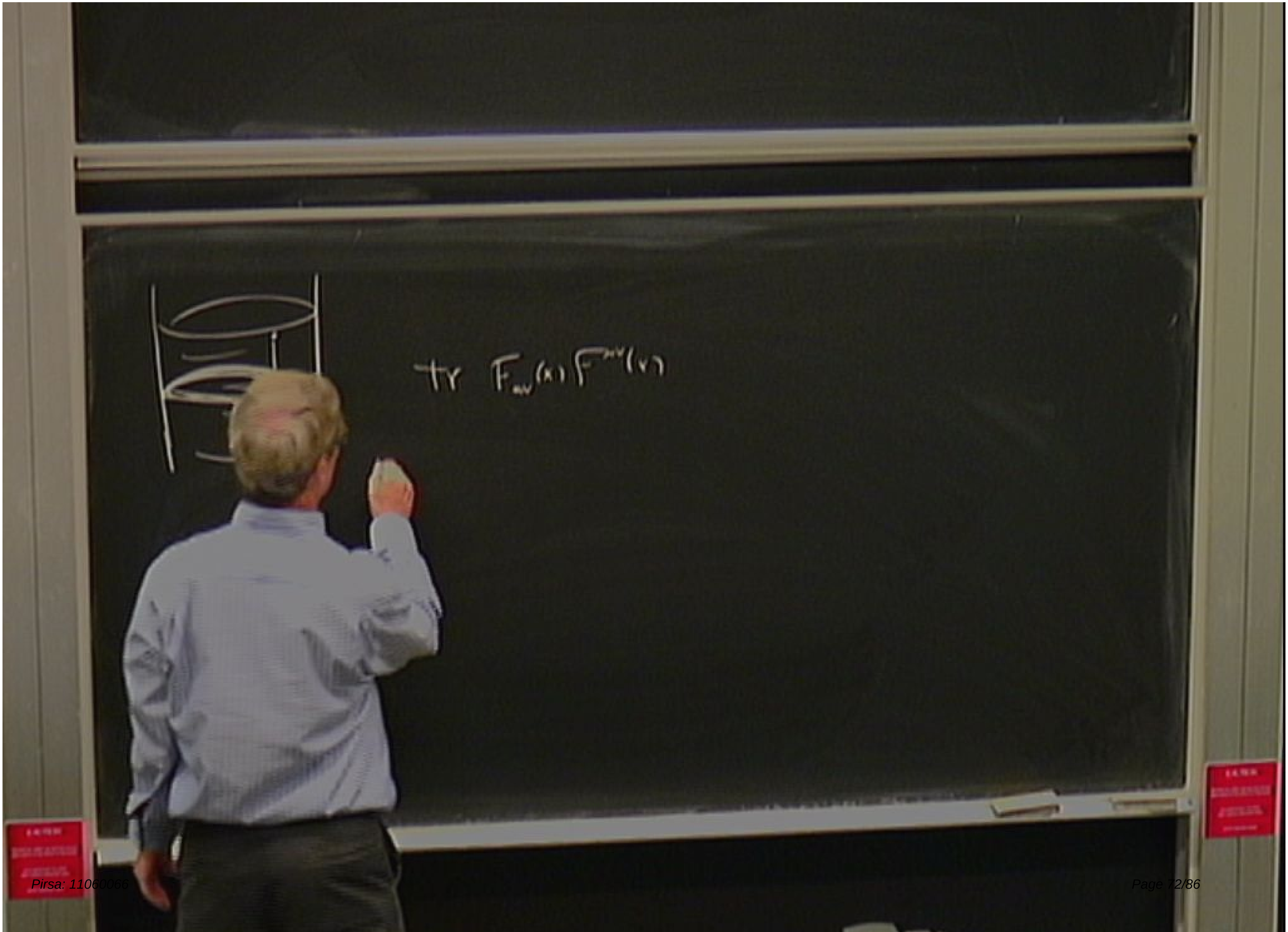

2r

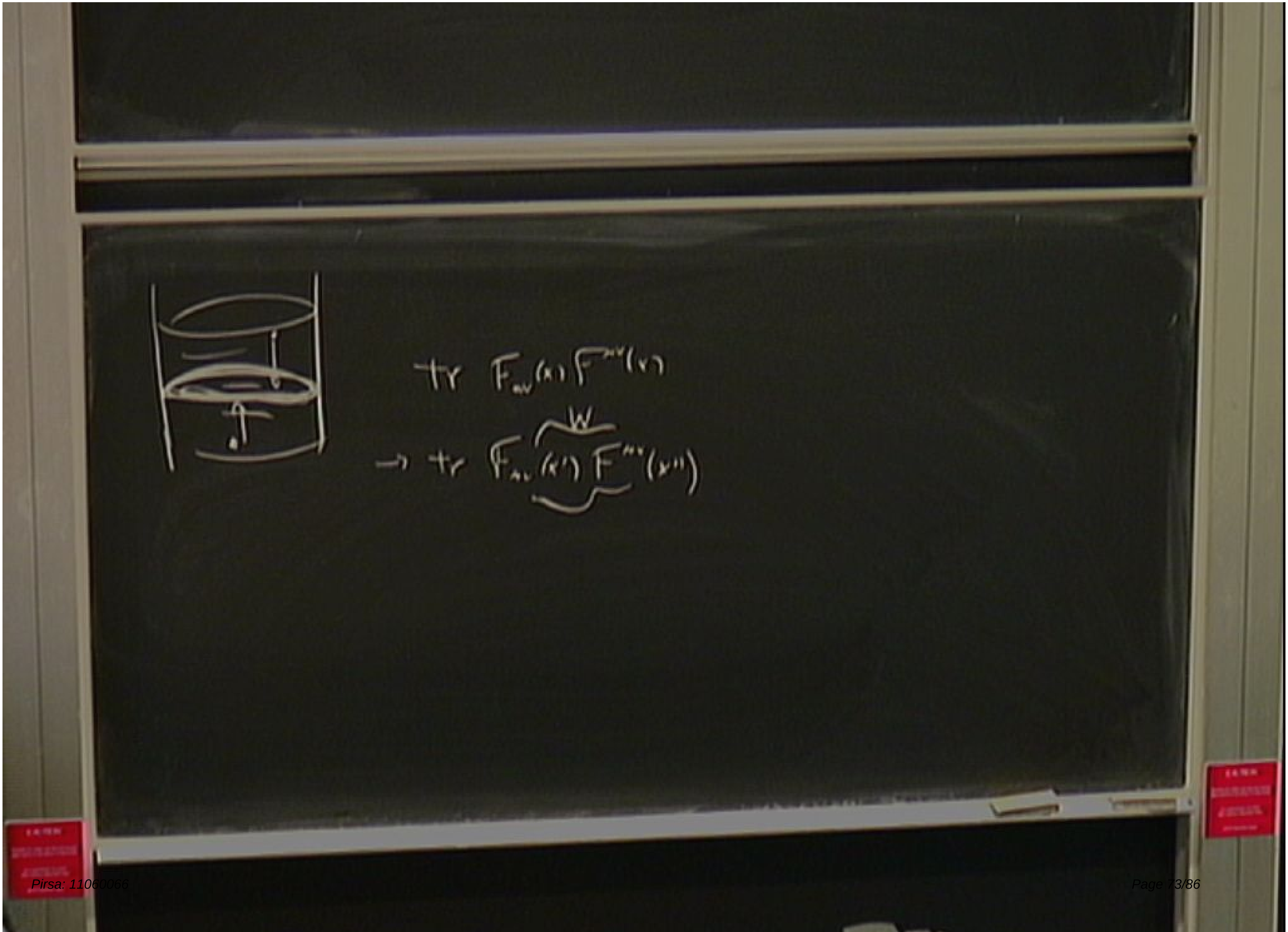


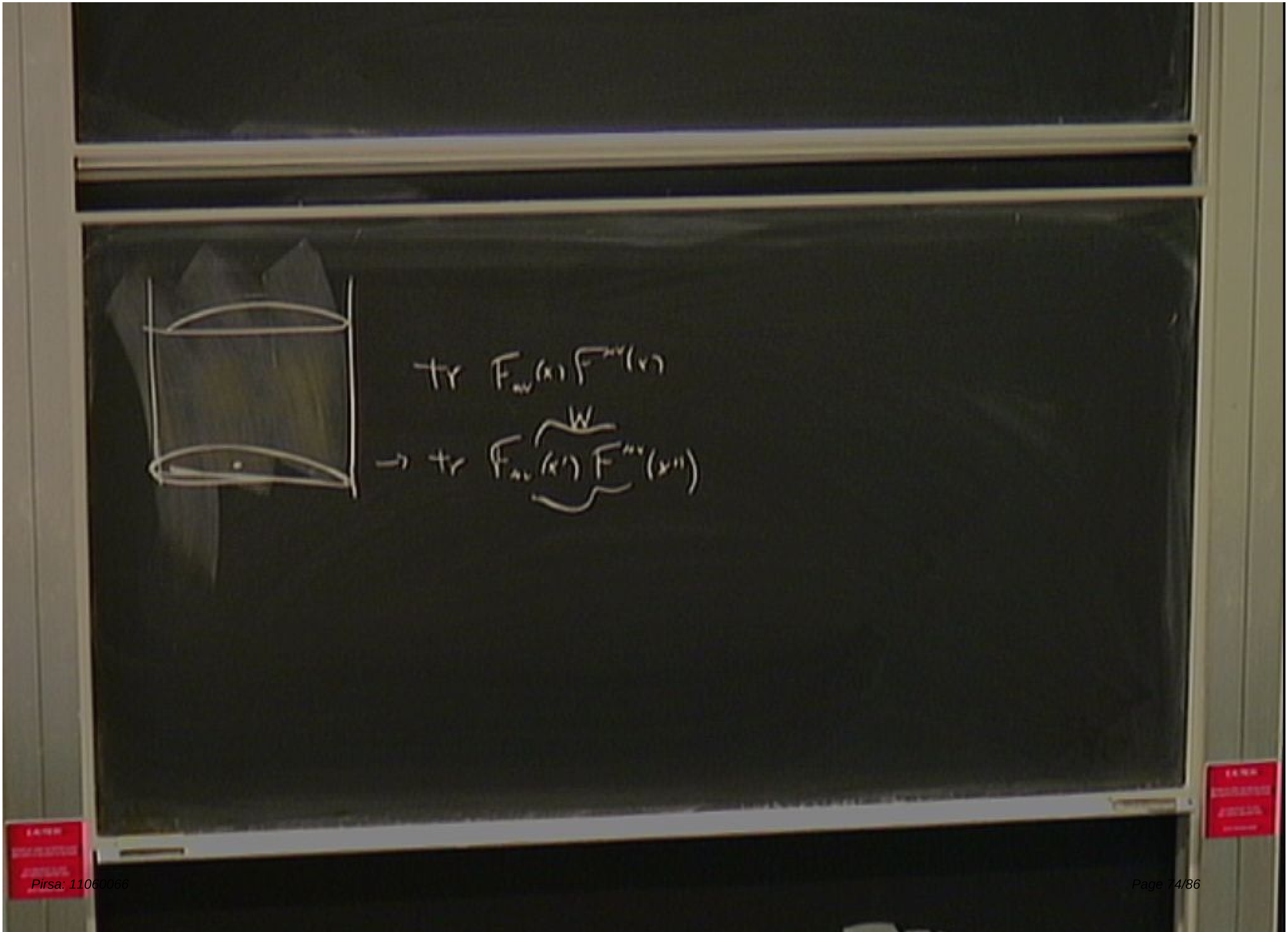

G(x,z) = ... + g ∫d⁴x'dz' φ²(x',z')
G(x,z;x',z')
2π





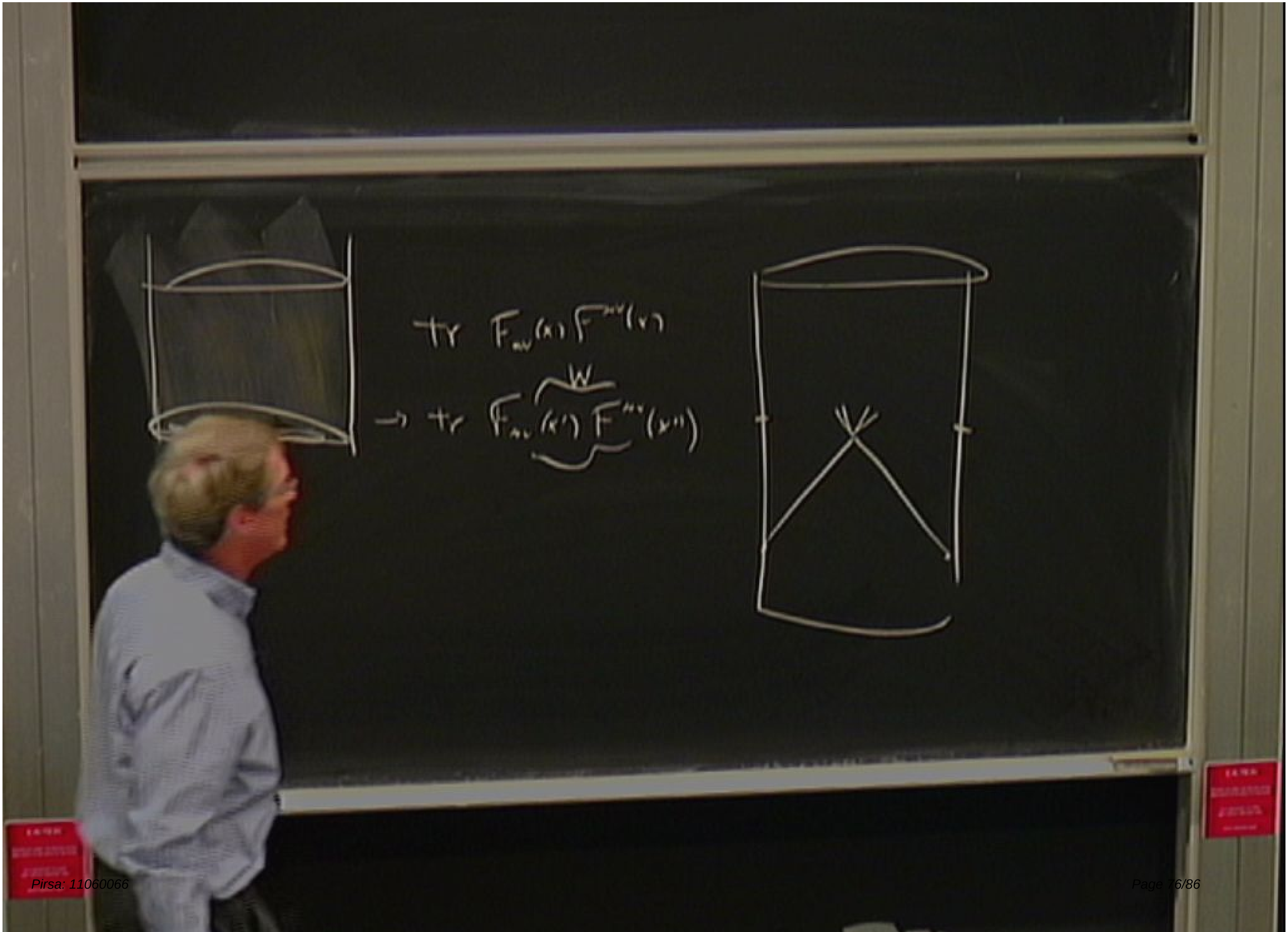

tr $F_{\mu\nu}(x) F^{\mu\nu}(y)$

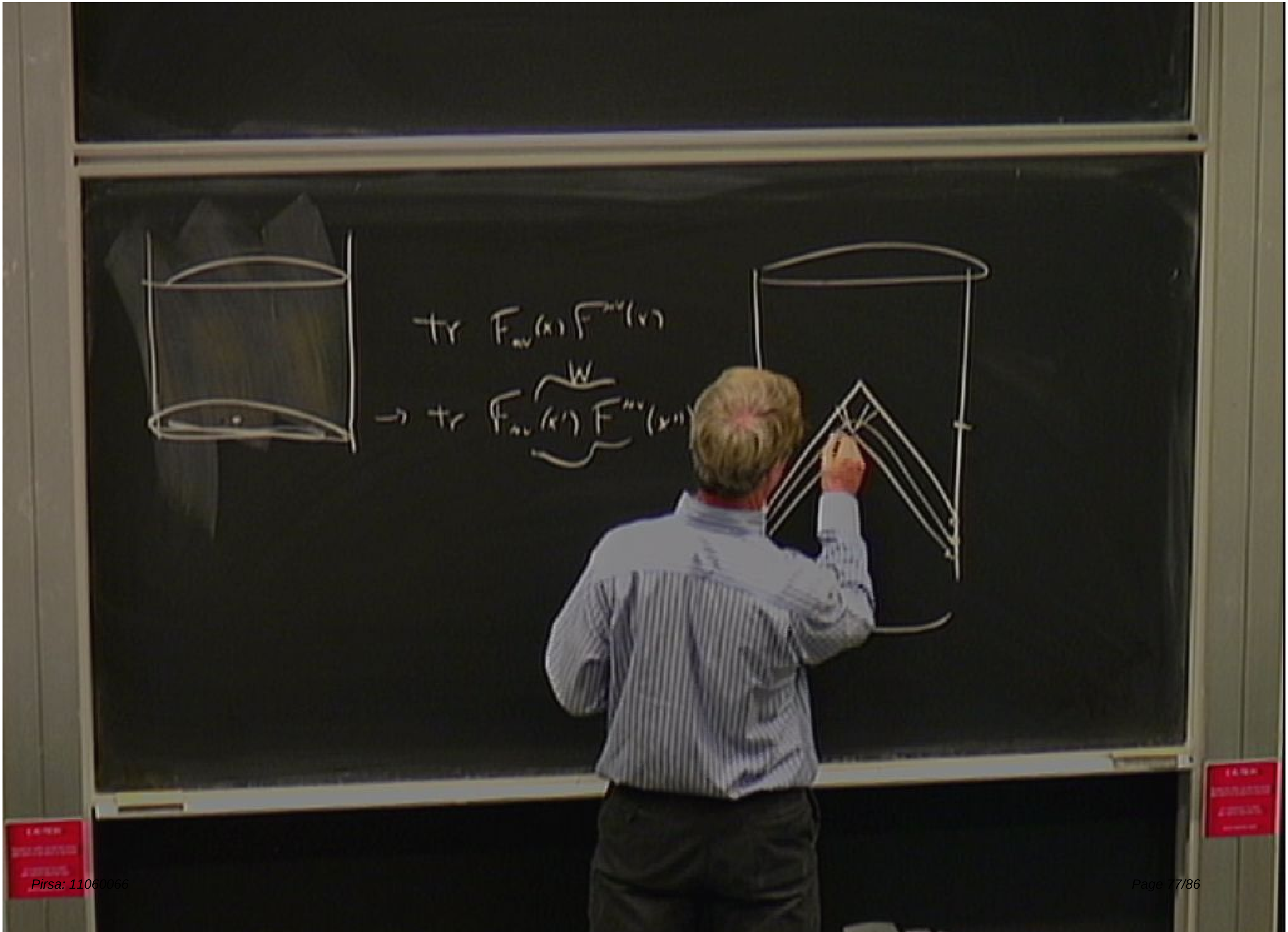

$\mathrm{tr}\, F_{\mu\nu}(x) F^{\mu\nu}(x)$
W
$\to \mathrm{tr}\, F_{\mu\nu}(x') F^{\mu\nu}(x'')$

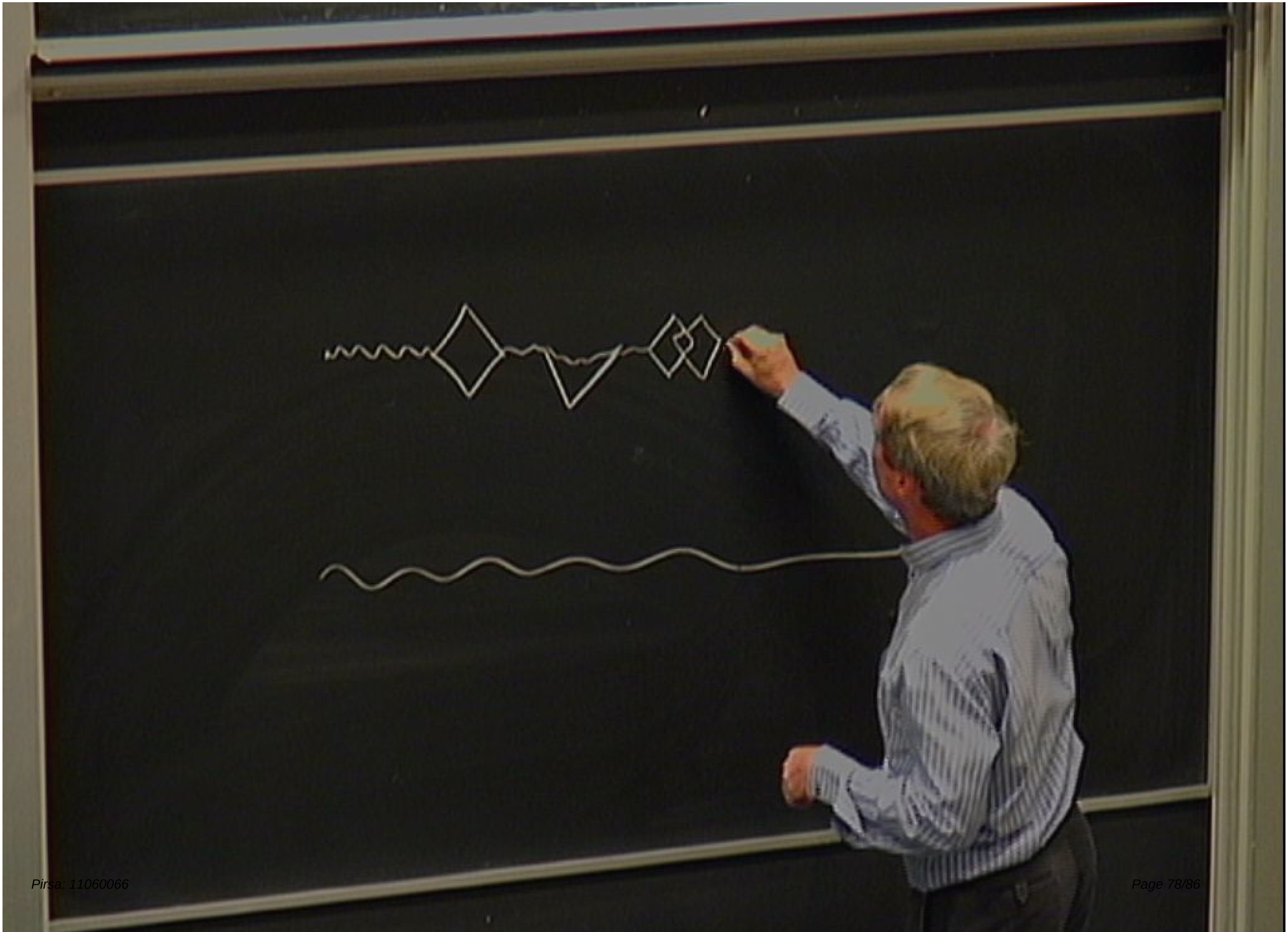

tr F_{μν}(x) F^{μν}(x)
W
→ tr F_{μν}(x') F^{μν}(x'')

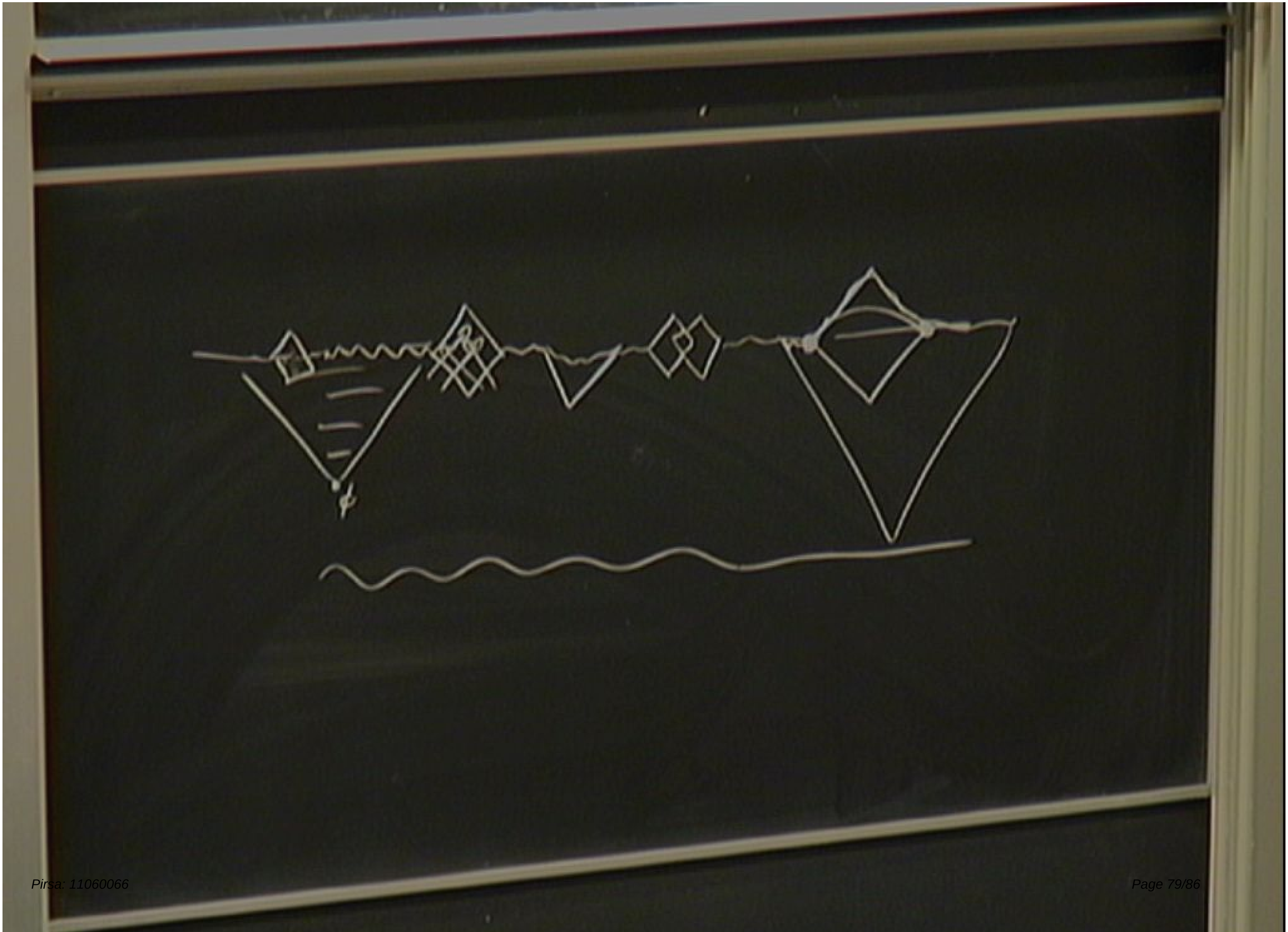
$$\mathrm{tr}\, F_{\mu\nu}(x) F^{\mu\nu}(x)$$

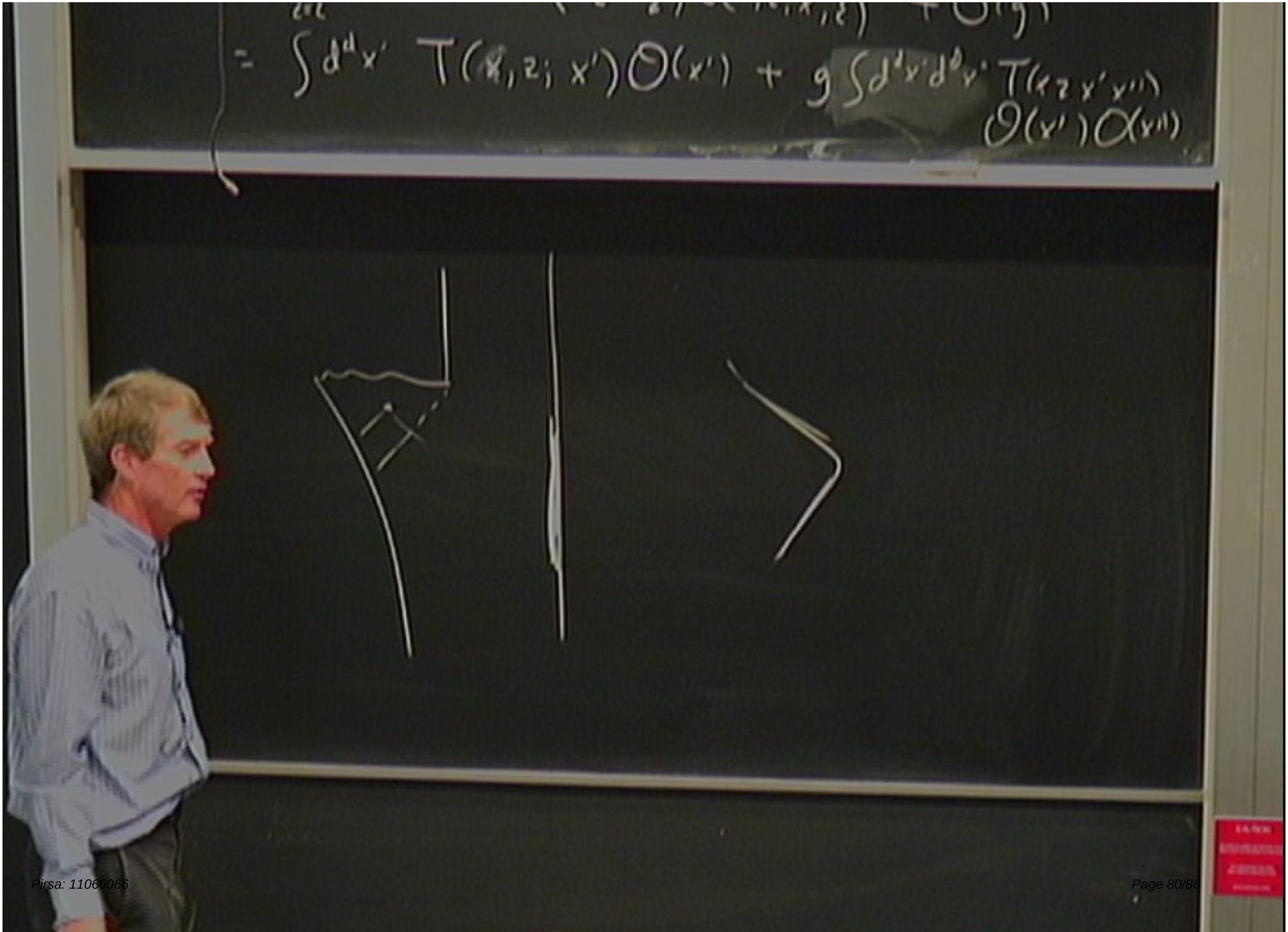
$$\rightarrow \mathrm{tr}\, F_{\mu\nu}(x') \, W \, F^{\mu\nu}(x'')$$


tr $F_{\mu\nu}(x) F^{\mu\nu}(x)$
W
→ tr $F_{\mu\nu}(x') F^{\mu\nu}(x'')$

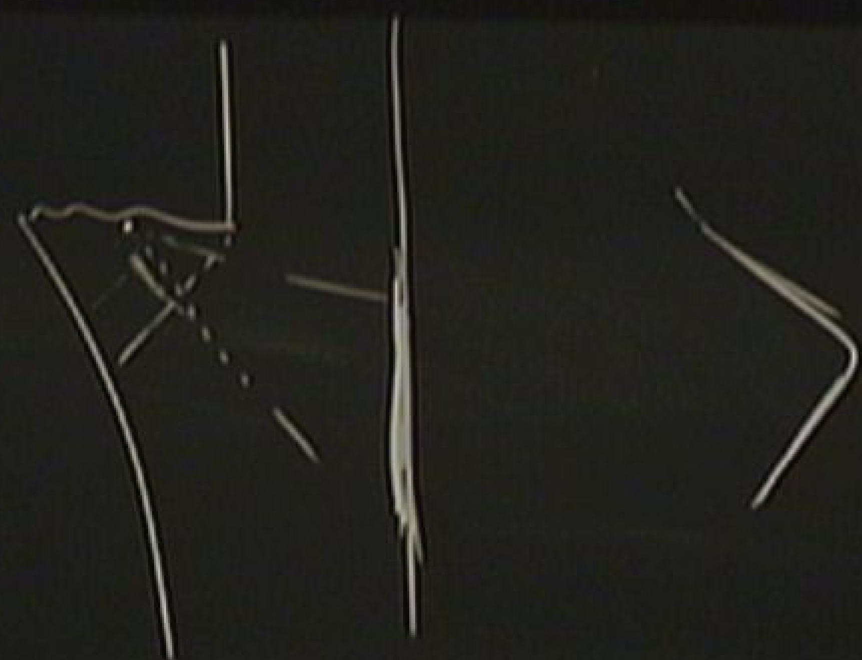

tr $F_{\mu\nu}(x) F^{\mu\nu}(x)$
W
→ tr $F_{\mu\nu}(x') F^{\mu\nu}(x'')$

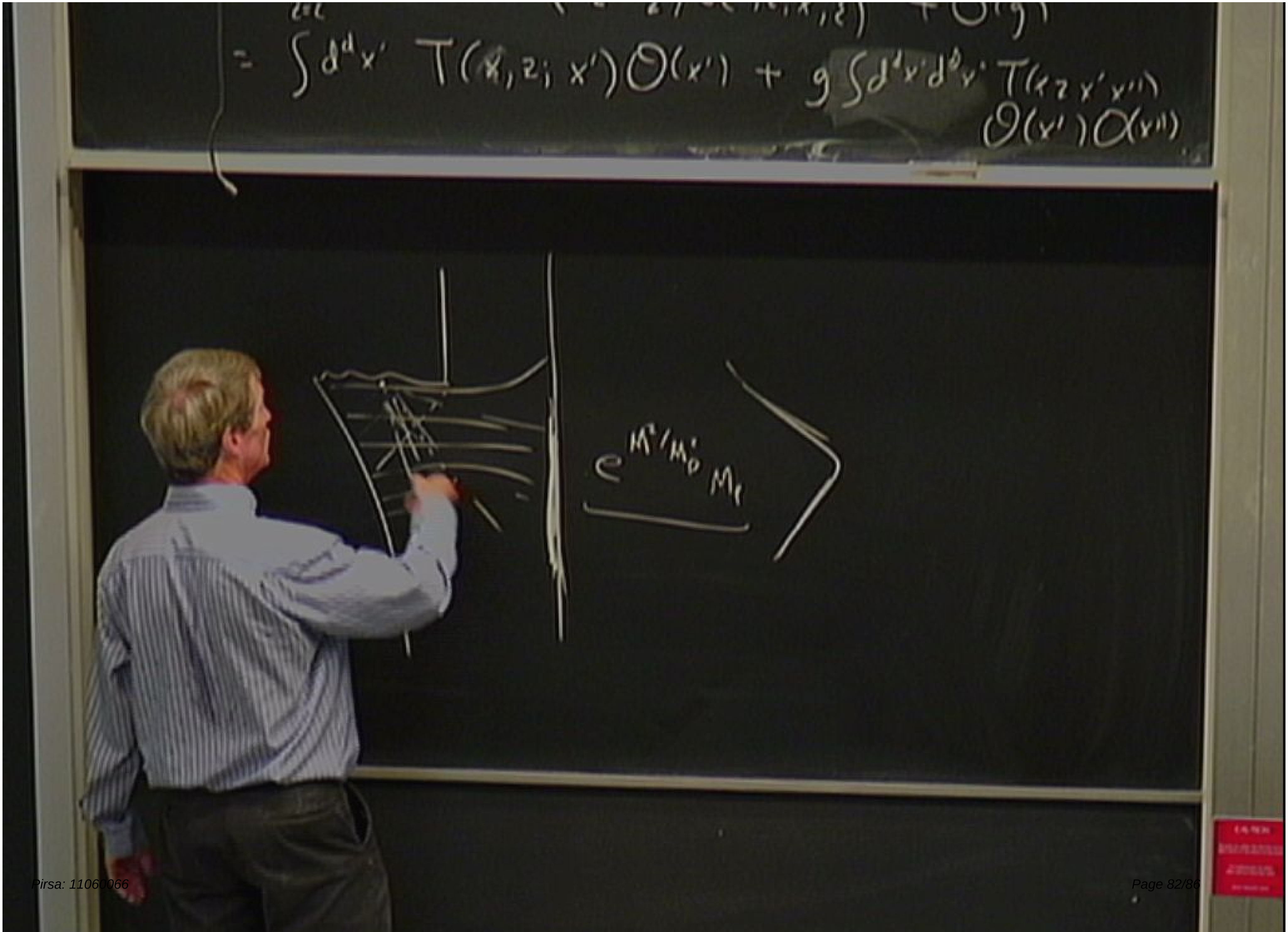


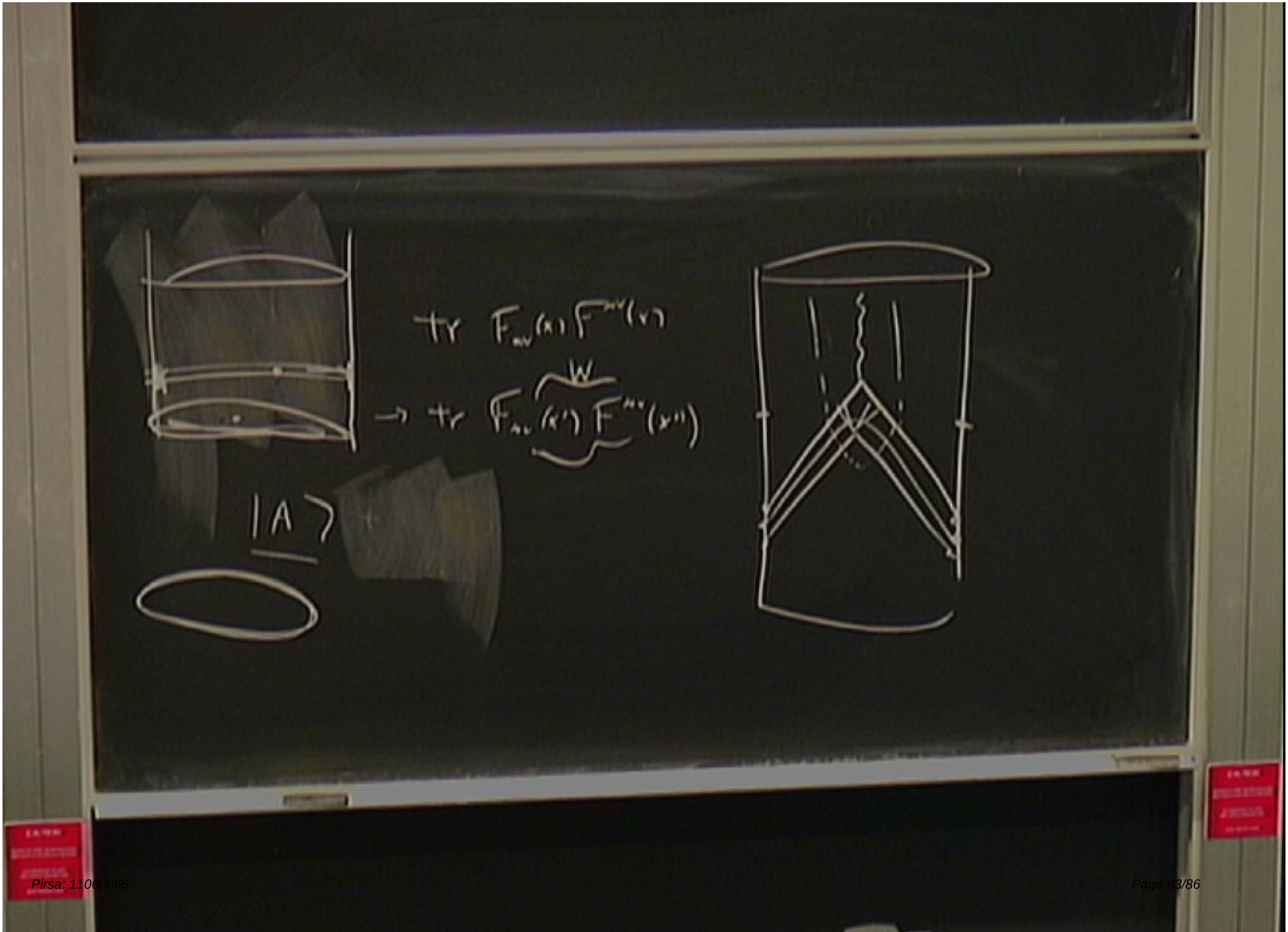


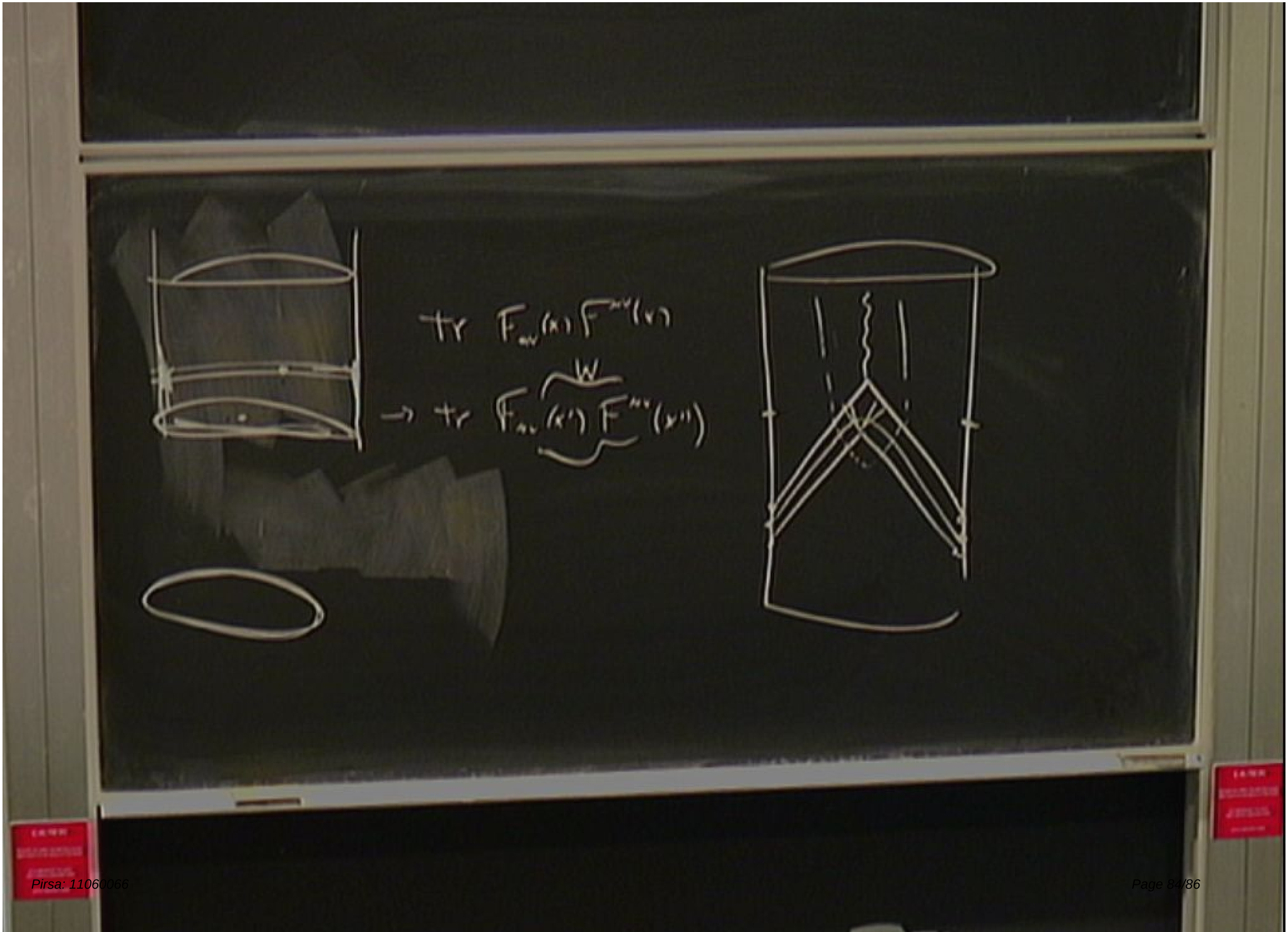

= ∫d^d x' T(x, z; x') O(x') + g ∫d^d x' d^d x'' T(x z x' x'')
O(x') O(x'')

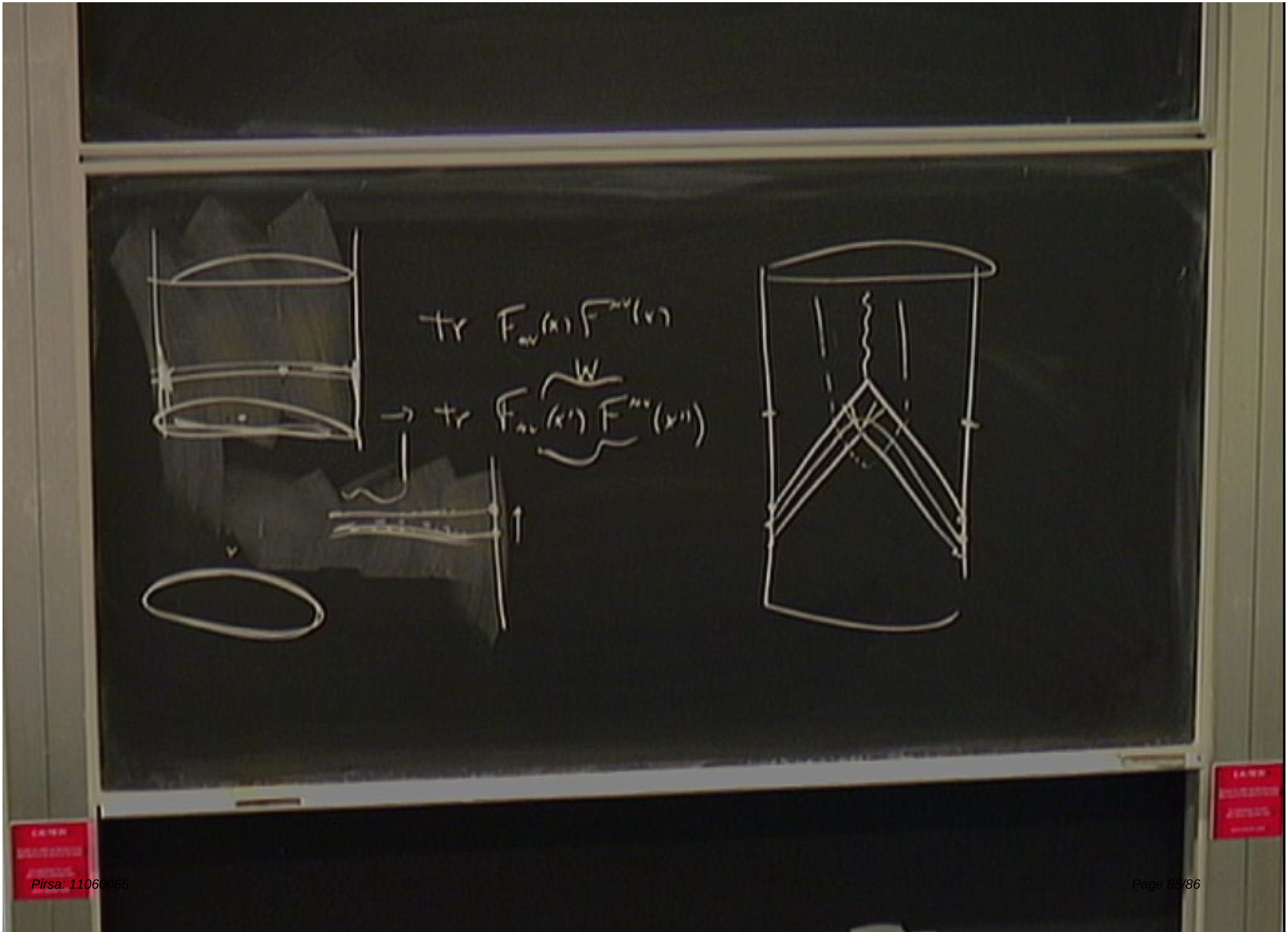
$$= \int d^d x' \, T(x, z; x') \, \mathcal{O}(x') + g \int d^d x' d^d x'' \, T(x\, z\, x'\, x'') \, \mathcal{O}(x') \mathcal{O}(x'')$$

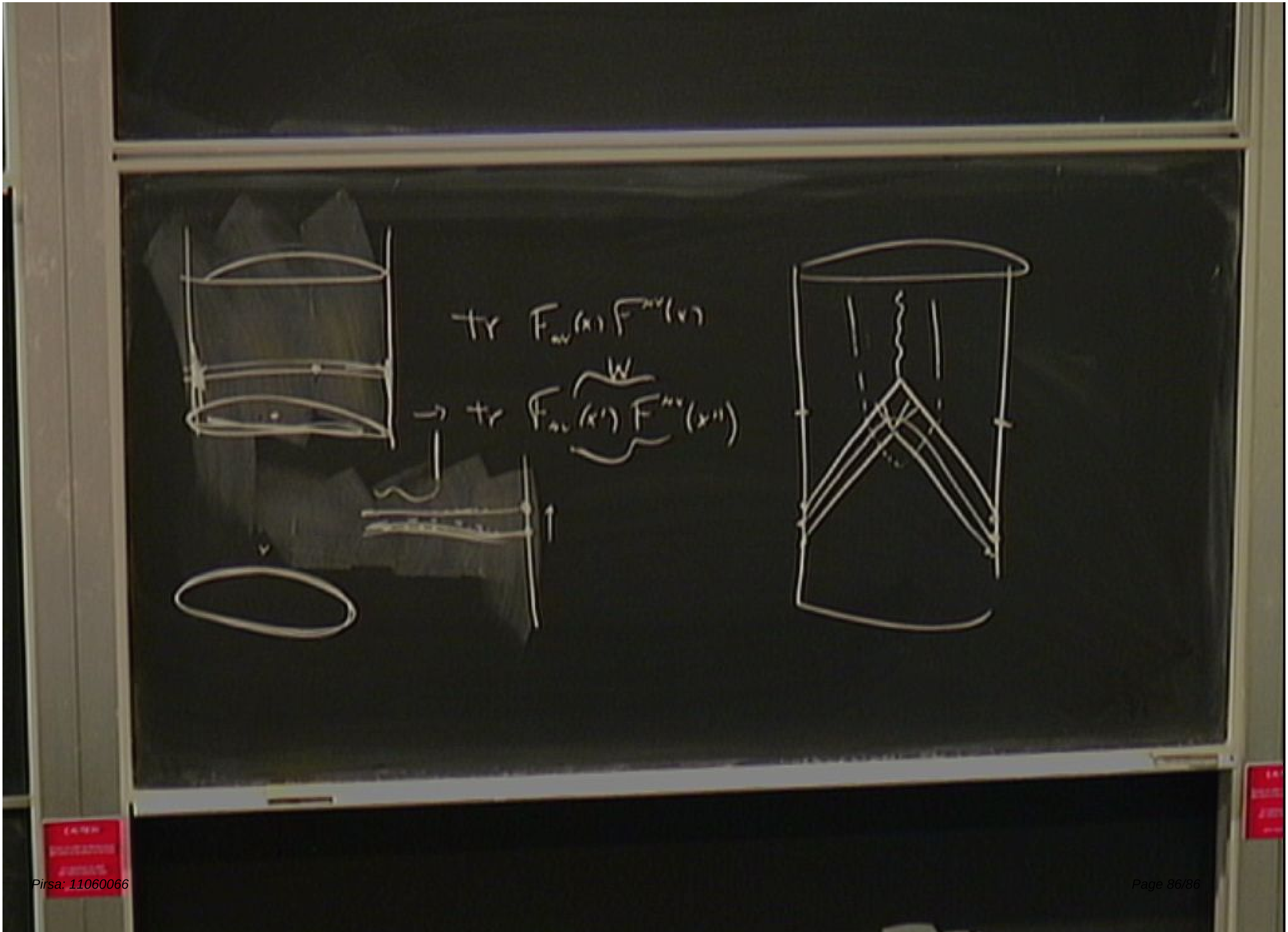



= ∫d^d x' T(x, z; x') O(x') + g ∫d^d x' d^d x'' T(x z x' x'') O(x') O(x'')


tr F_μν(x) F^μν(x)
W
→ tr F_μν(x') F^μν(x'')
|A⟩


tr $F_{\mu\nu}(x) F^{\mu\nu}(x)$
W
→ tr $F_{\mu\nu}(x') F^{\mu\nu}(x'')$


tr F_{μν}(x) F^{μν}(x)
W
→ tr F_{μν}(x') F^{μν}(x'')


tr $F_{\mu\nu}(x) F^{\mu\nu}(x)$
W
$\rightarrow$ tr $F_{\mu\nu}(x') F^{\mu\nu}(x'')$