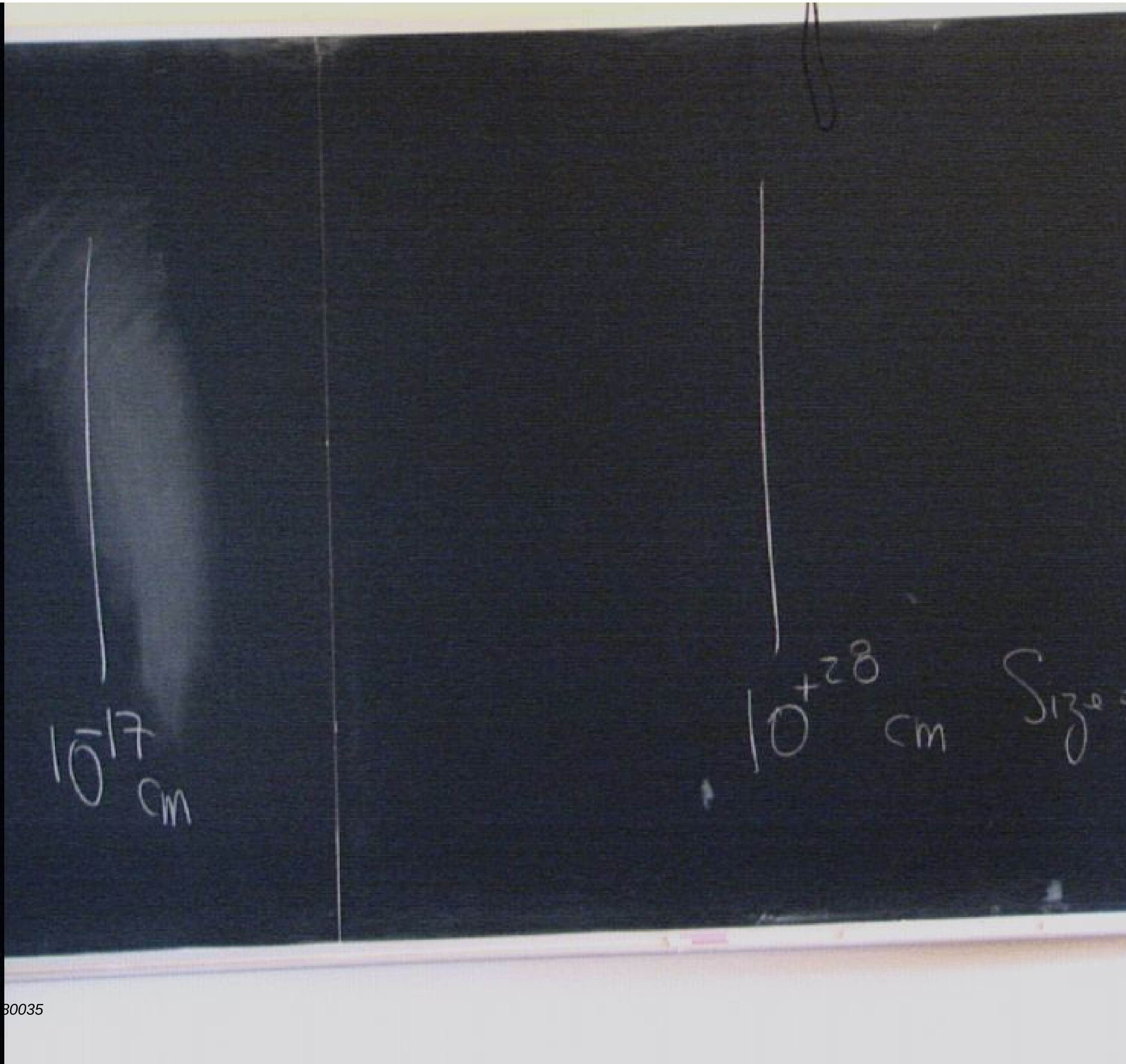
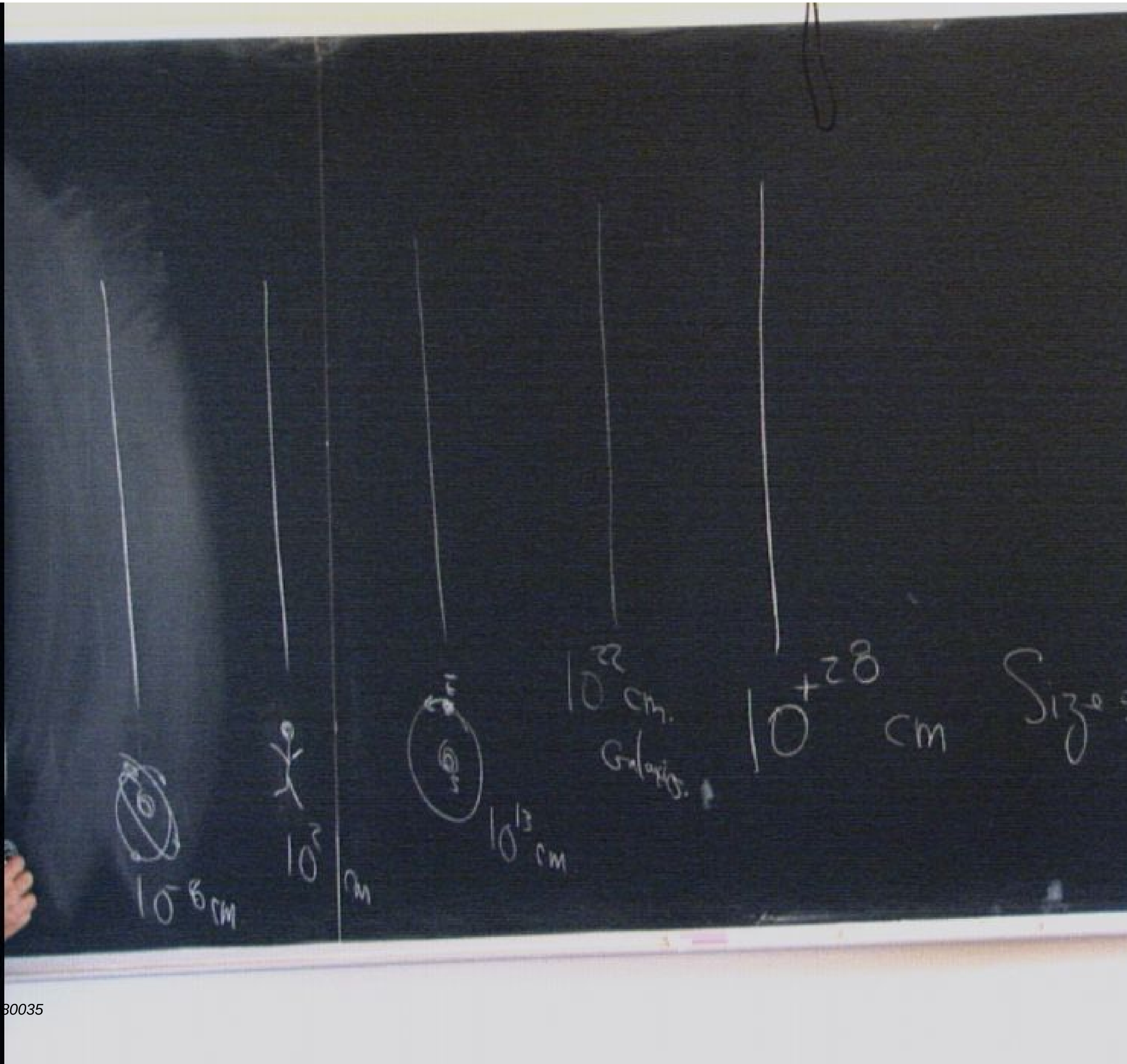
Title: PSI - Research Skills 1A

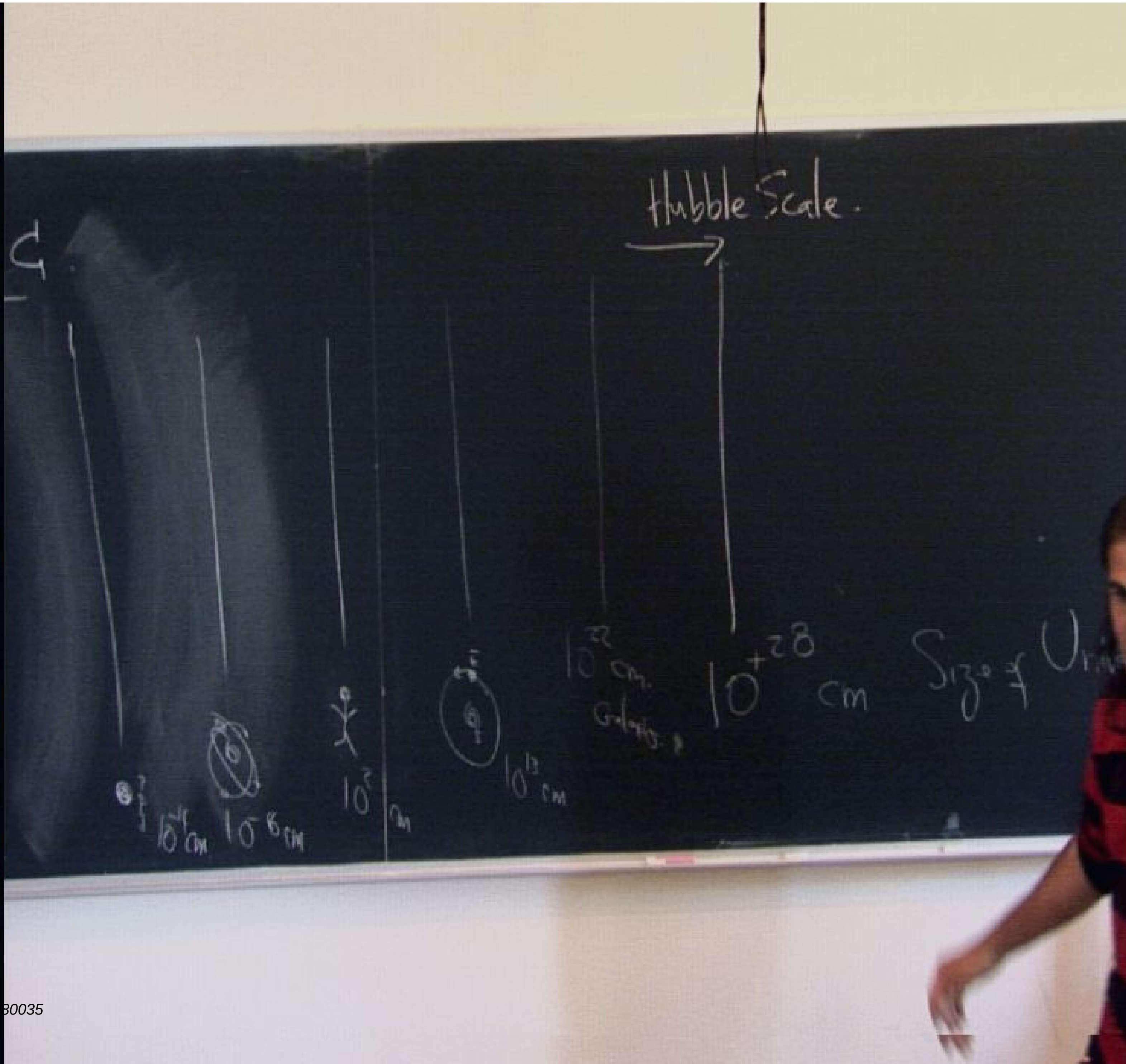
Date: Aug 24, 2009 09:00 AM

URL: http://pirsa.org/09080035

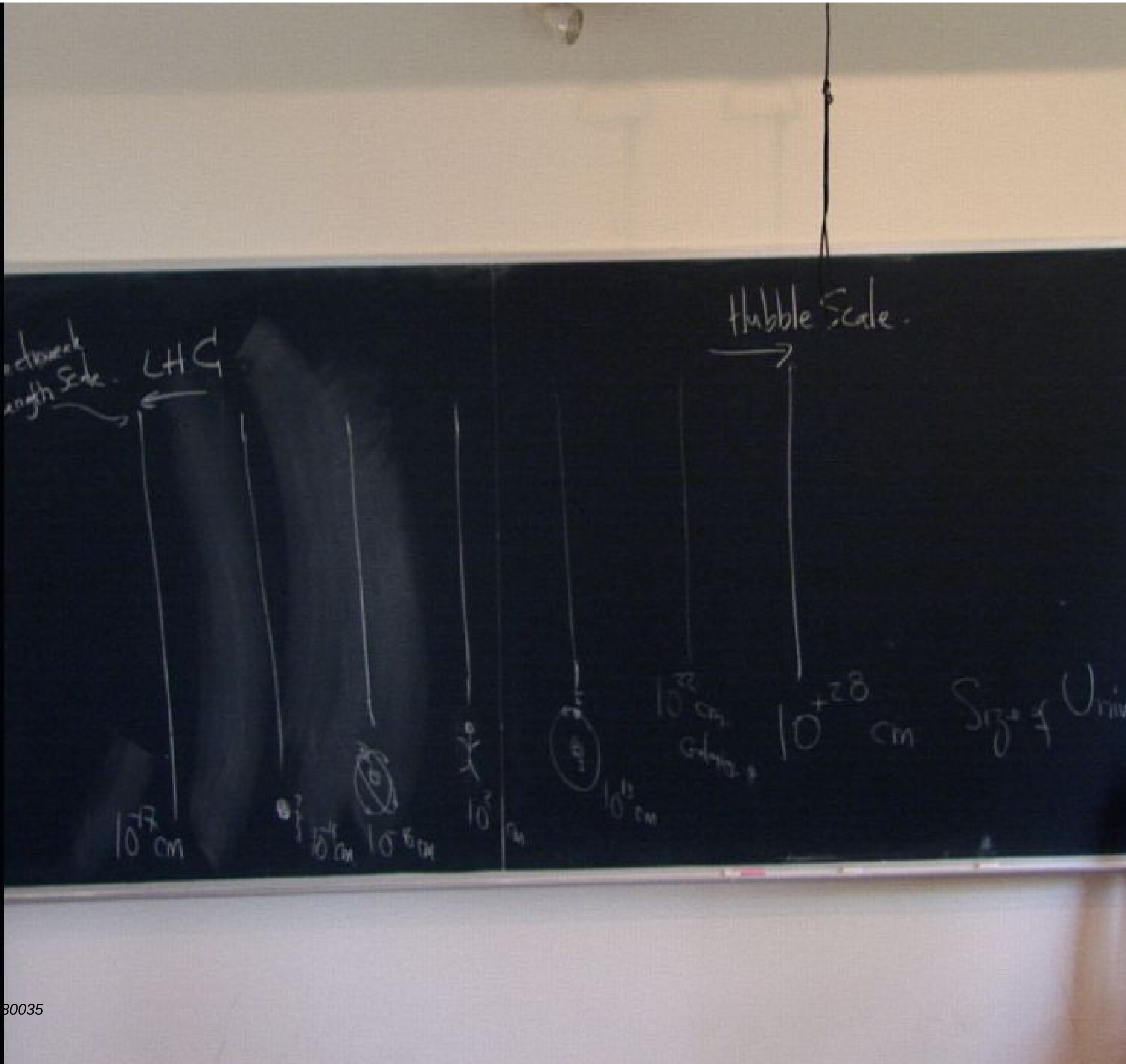
Abstract:

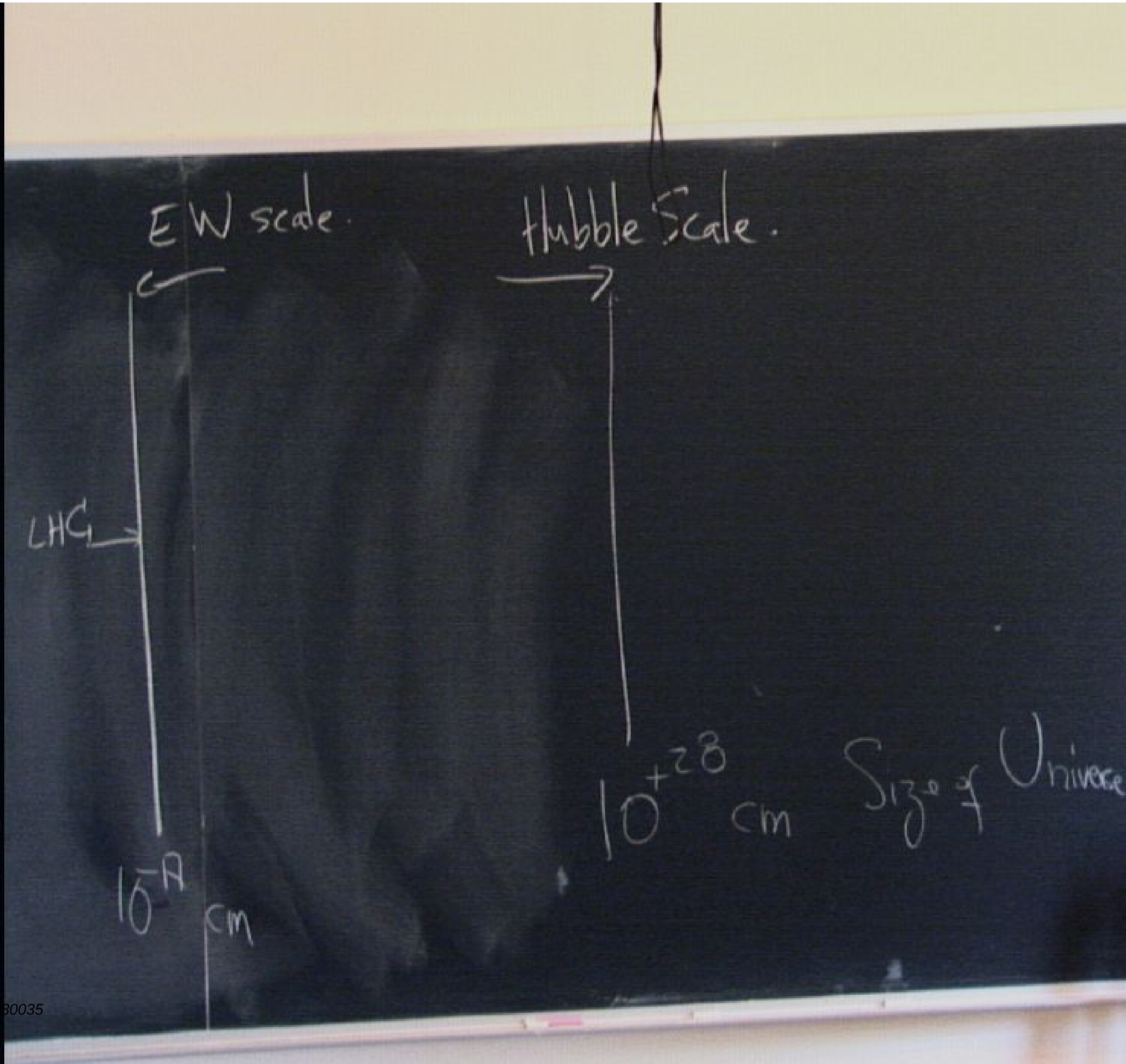

10^{-17} cm
10^{+28} cm
Size:

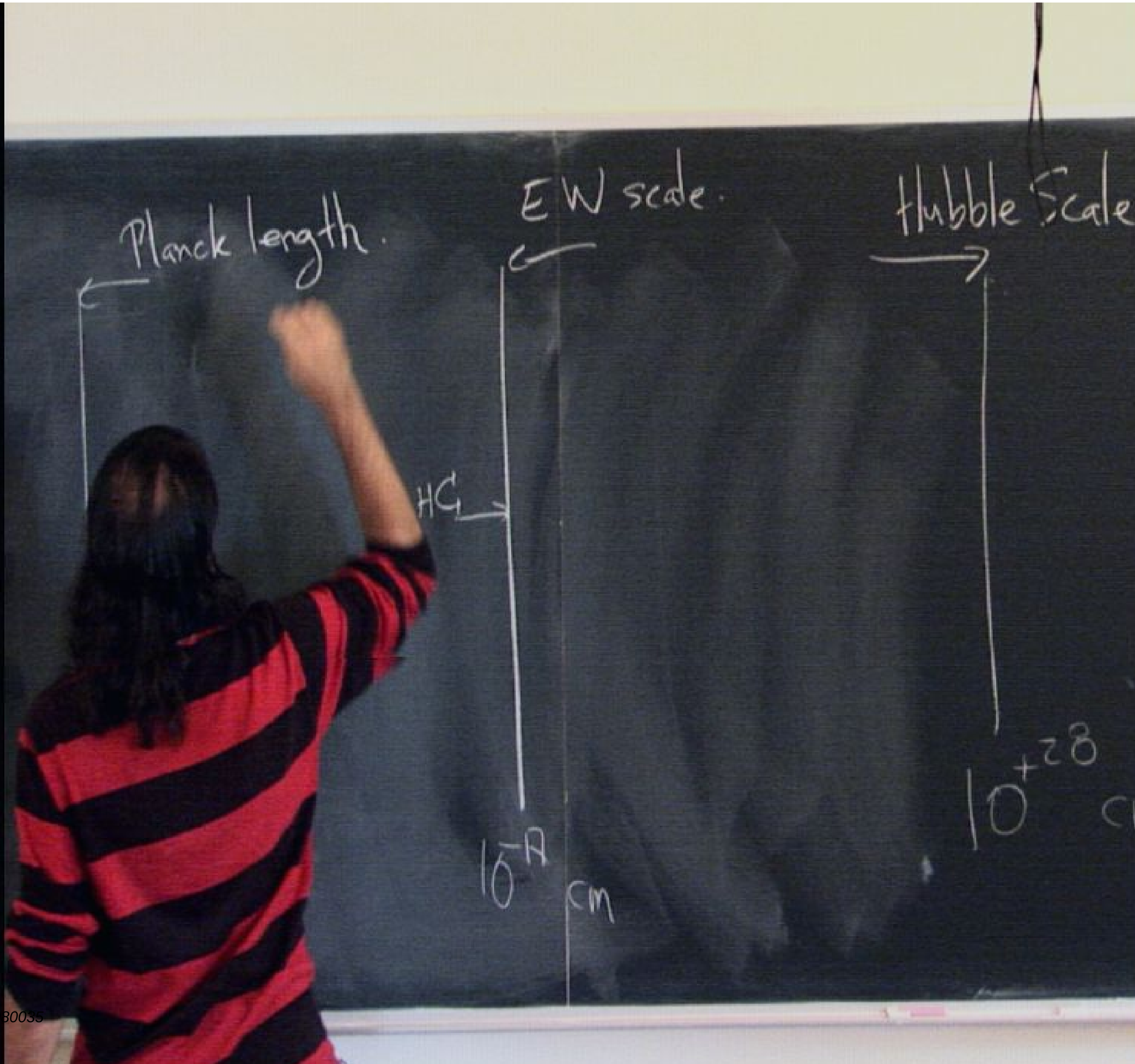

10^-8 cm
10^2 cm
10^13 cm
10^22 cm.
Galaxies.
10^+28 cm
Size :

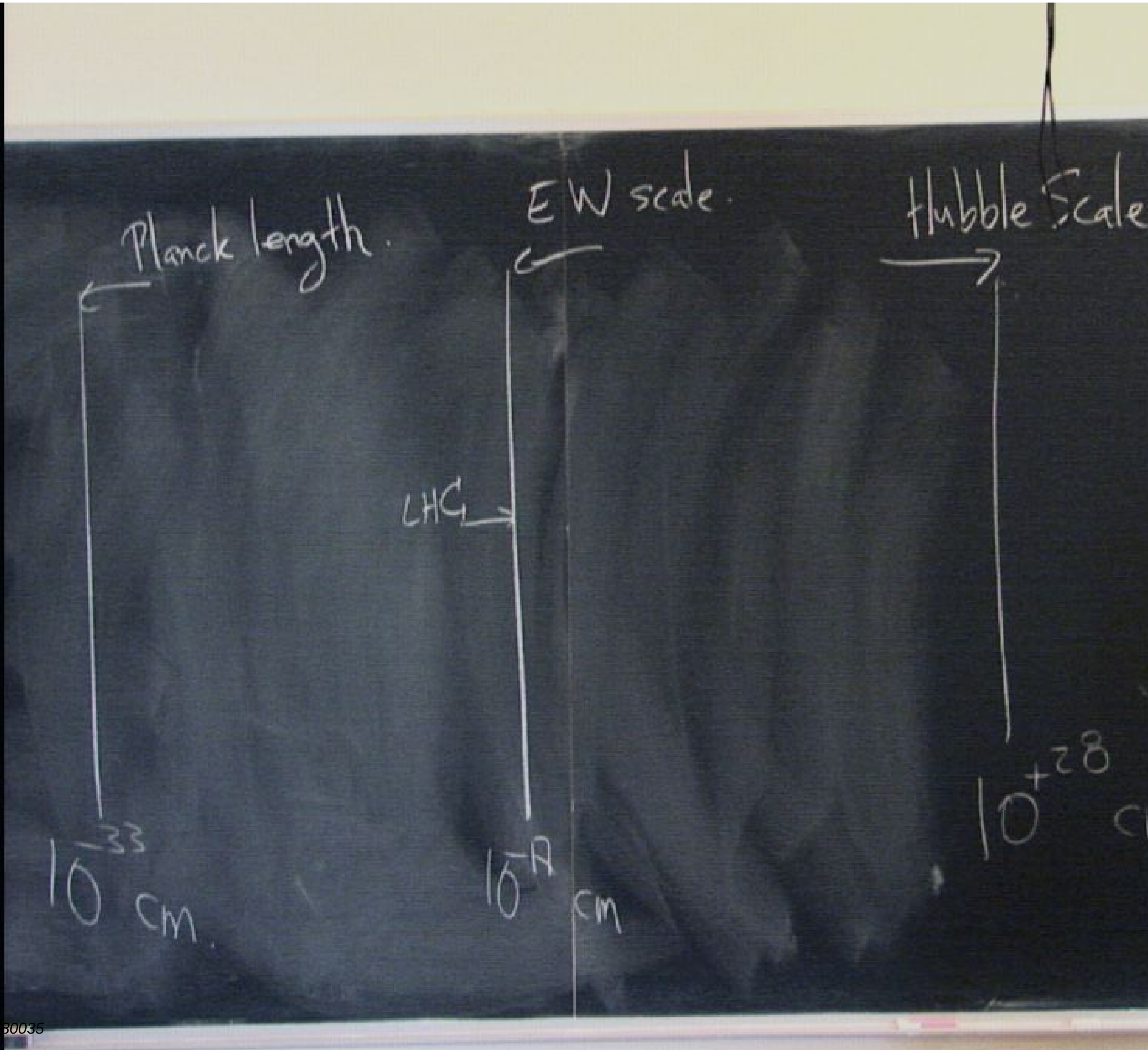


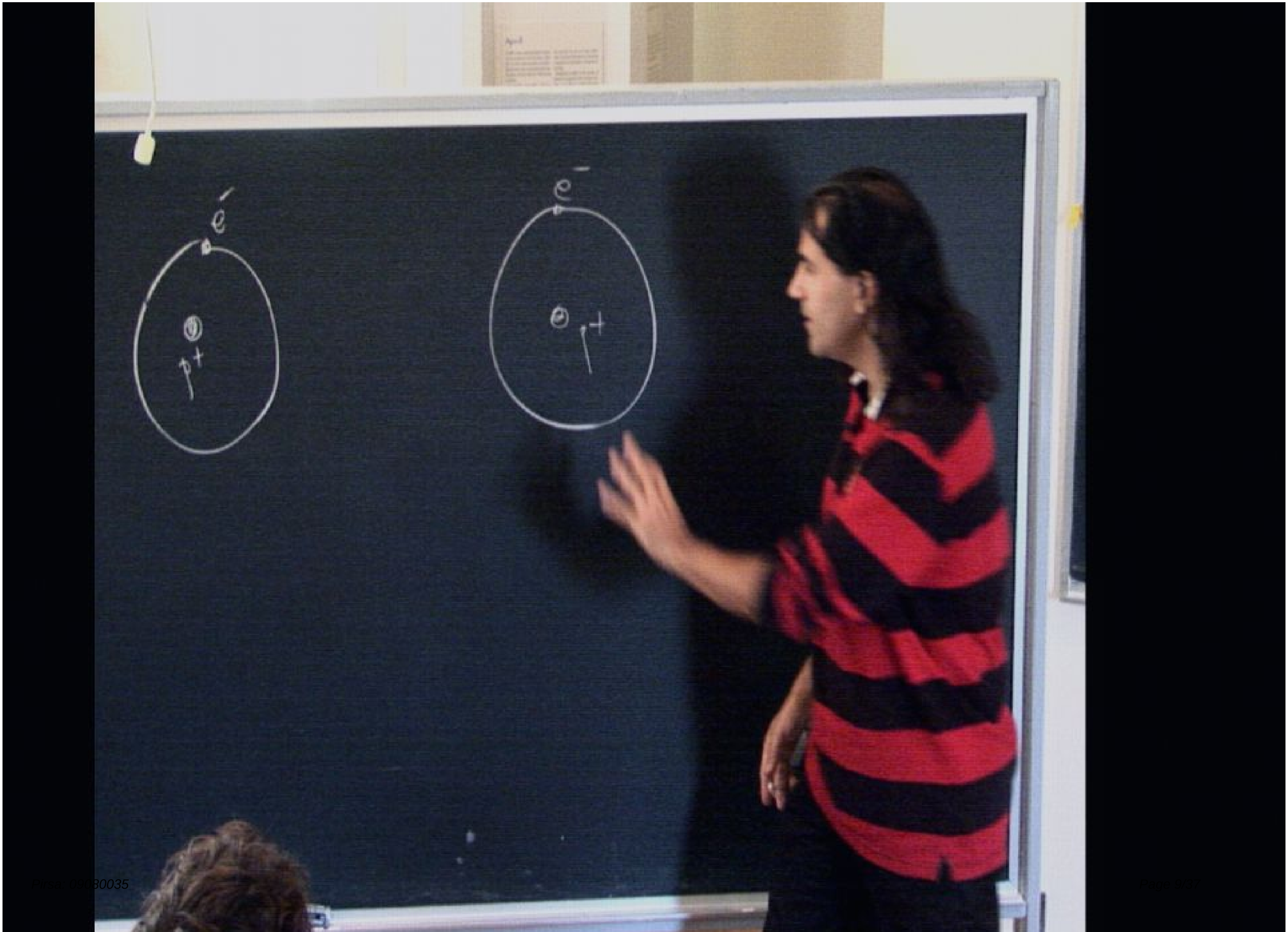
Hubble Scale.
10^-14 cm
10^-8 cm
10^2 cm
10^13 cm
10^22 cm.
Galaxies
10^+28 cm
Size of

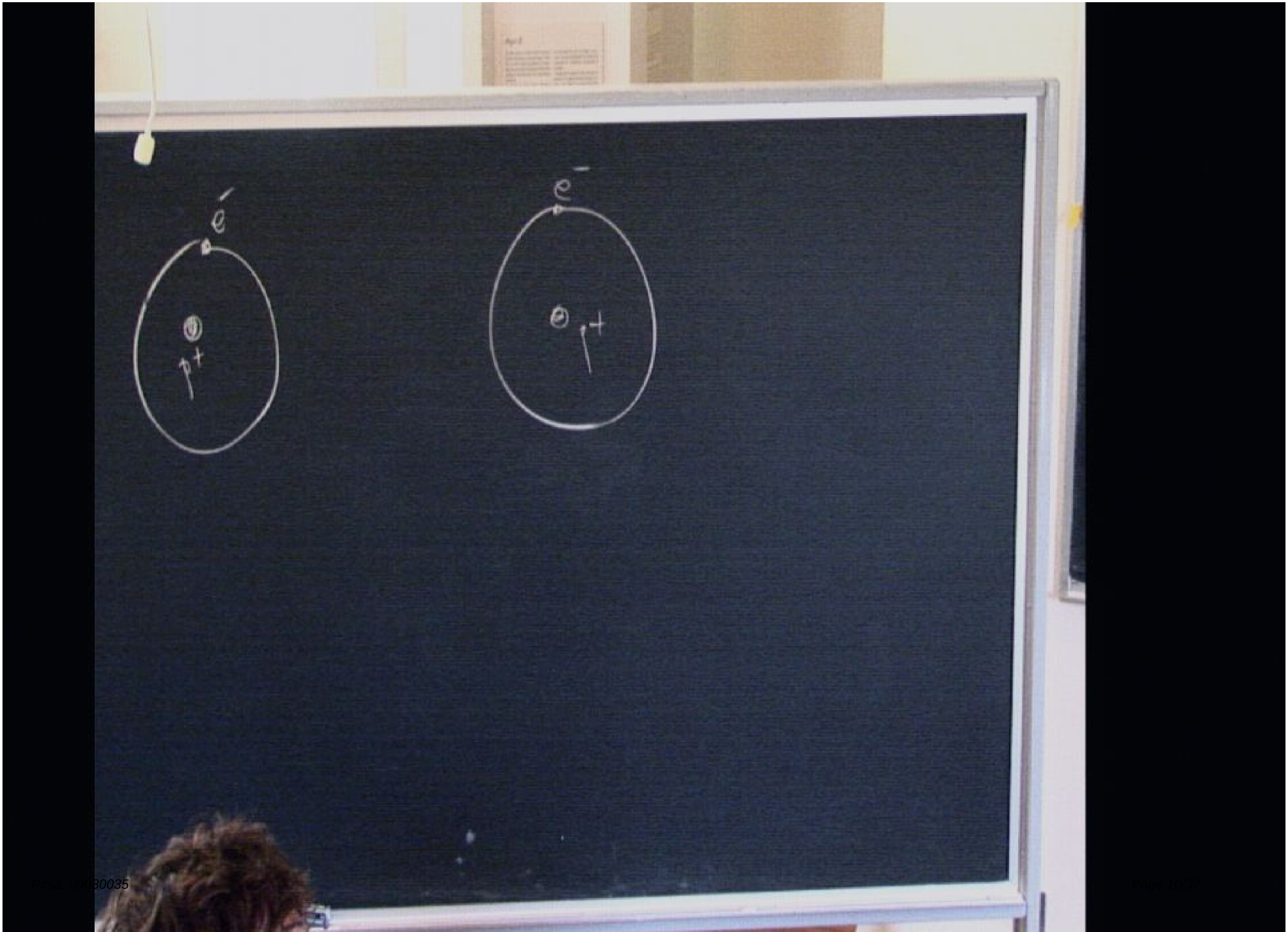

Hubble Scale.
LHC
Size of Unive
10⁺²⁸ cm


EW scale.
Hubble Scale.
LHC
10 cm
10^{+28} cm Size of Universe

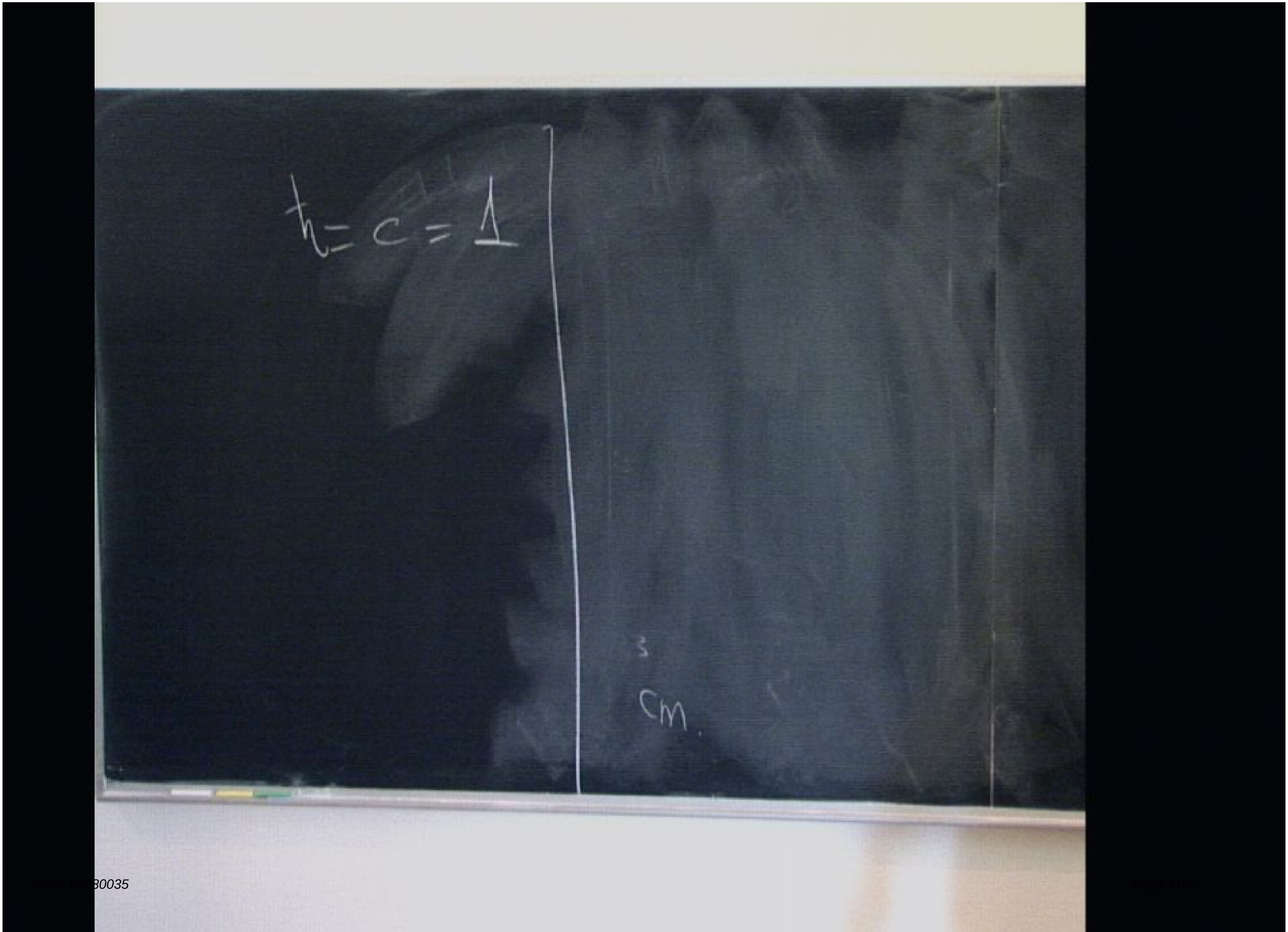

Planck length.
EW scale.
Hubble Scale
HC
cm
10+28

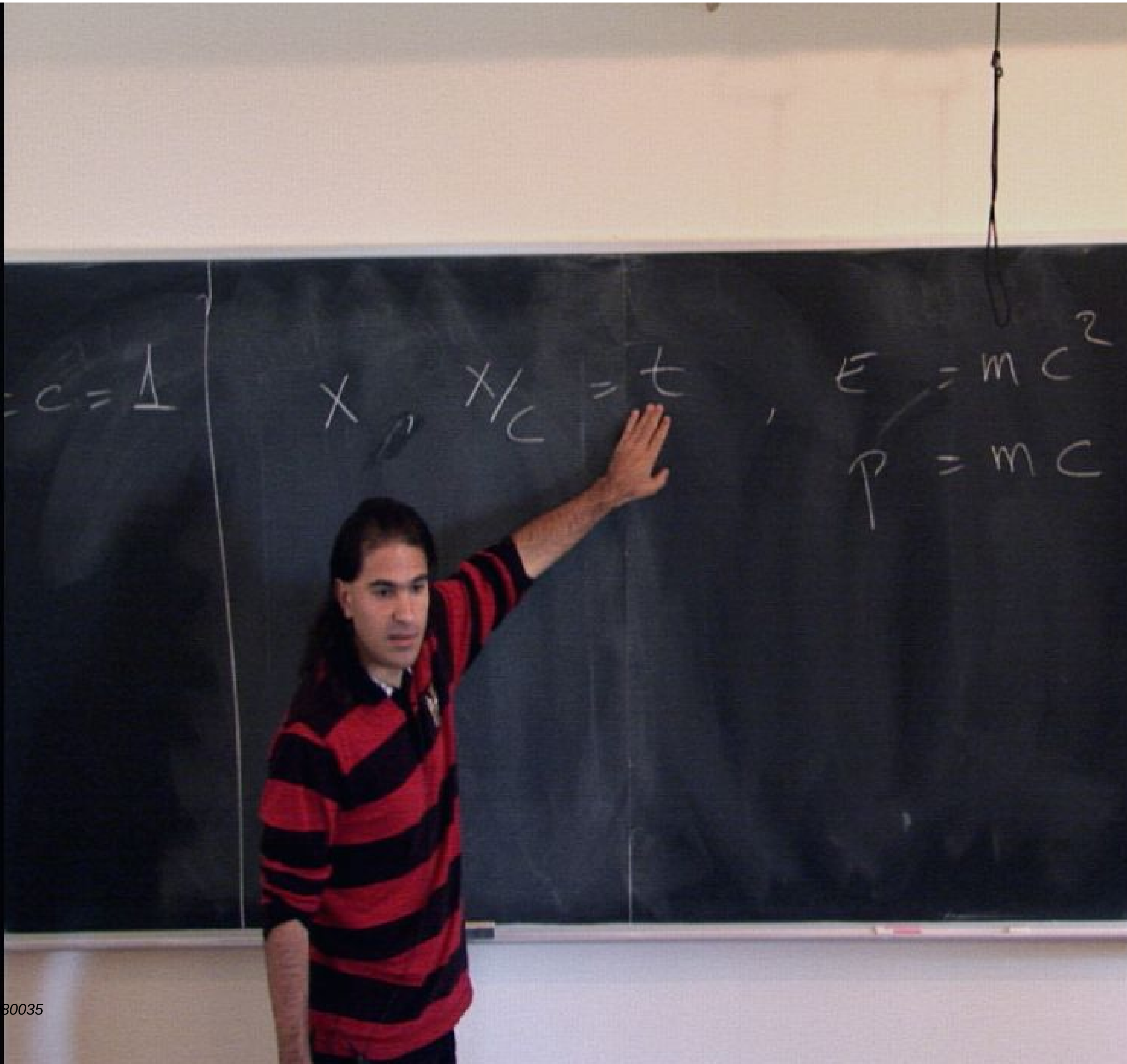

Planck length.
EW scale.
Hubble Scale
LHC
10-33 cm.
10-17 cm
10+28 cm

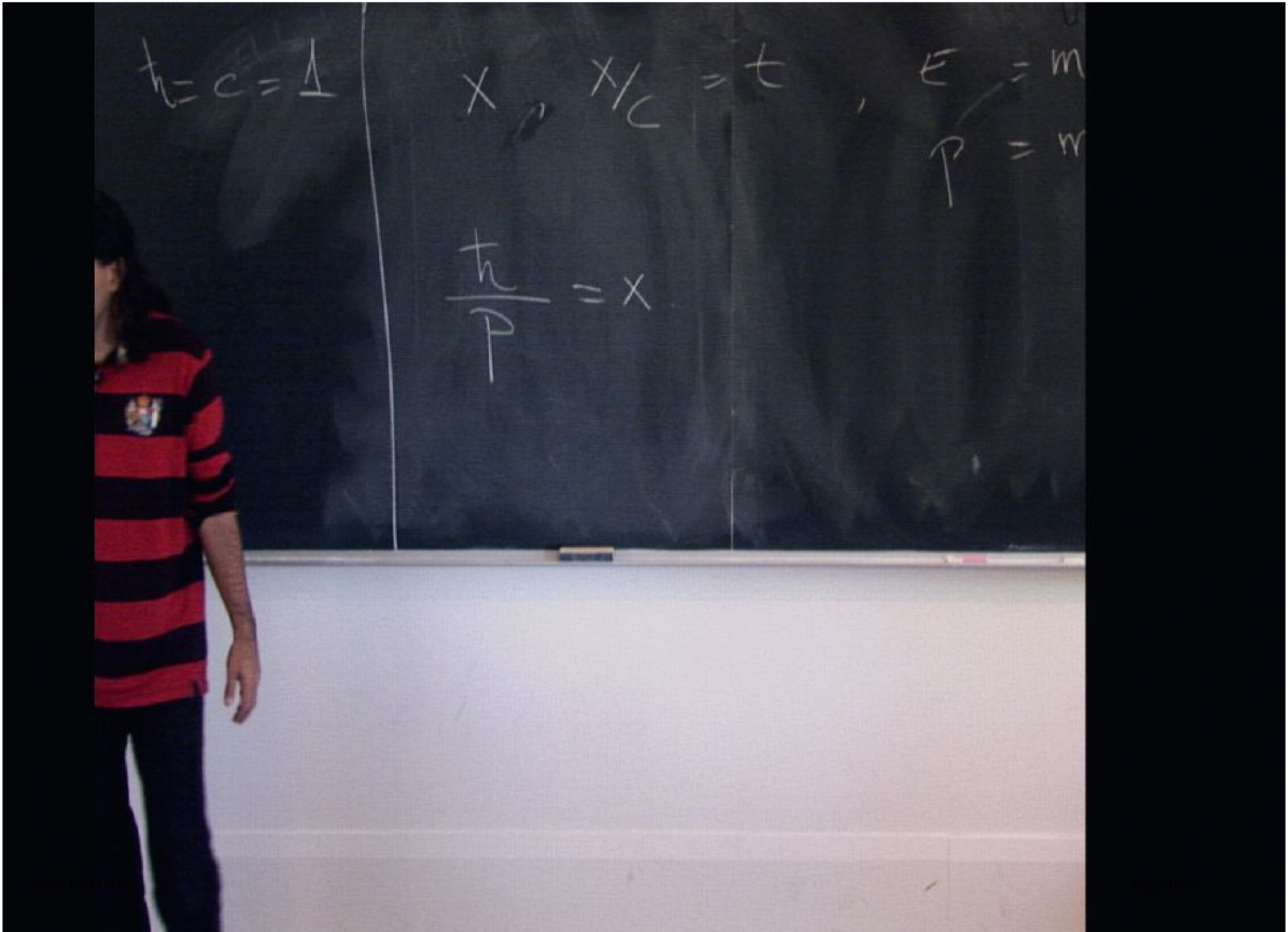

e-
p+
e-
p+

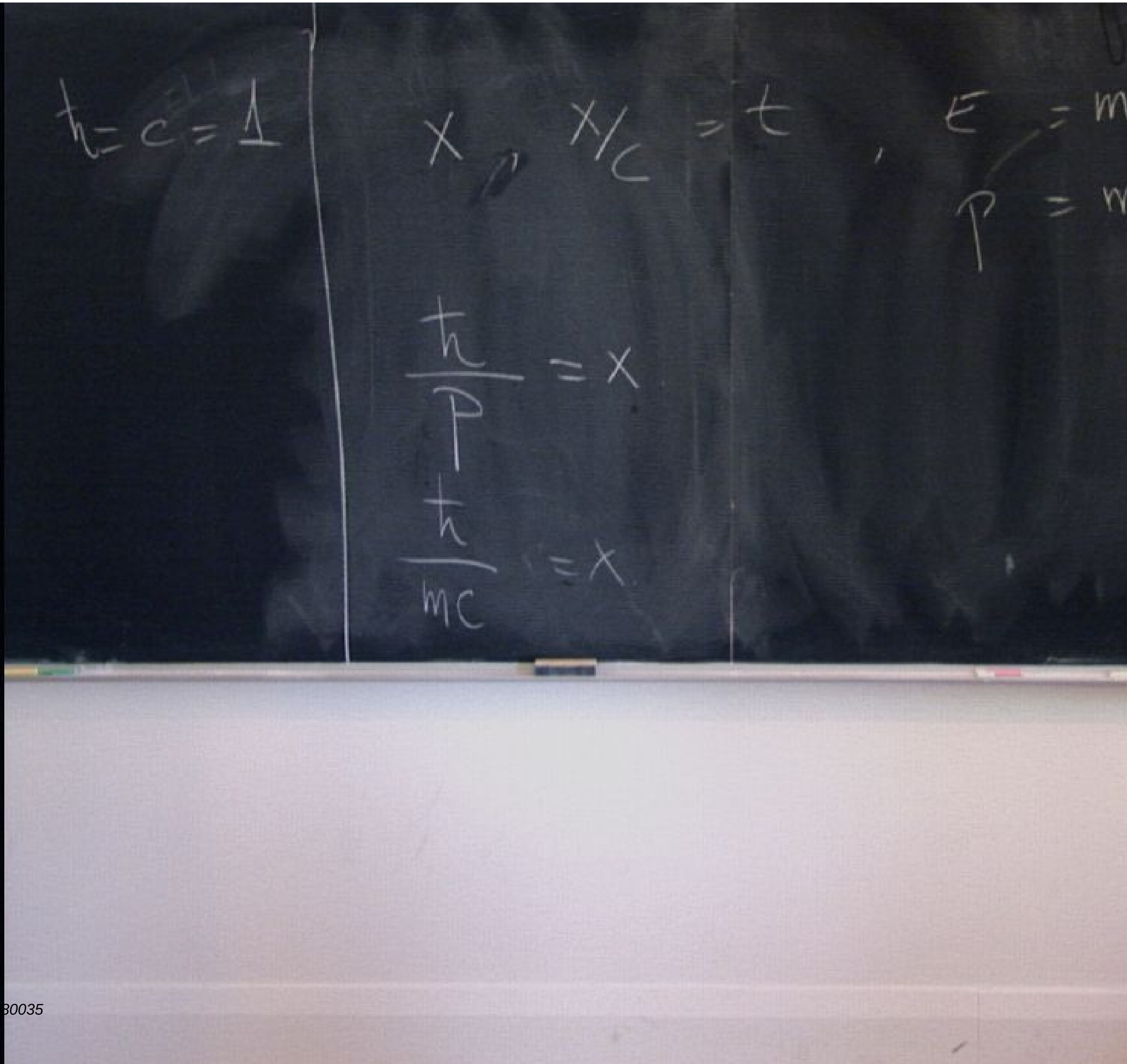


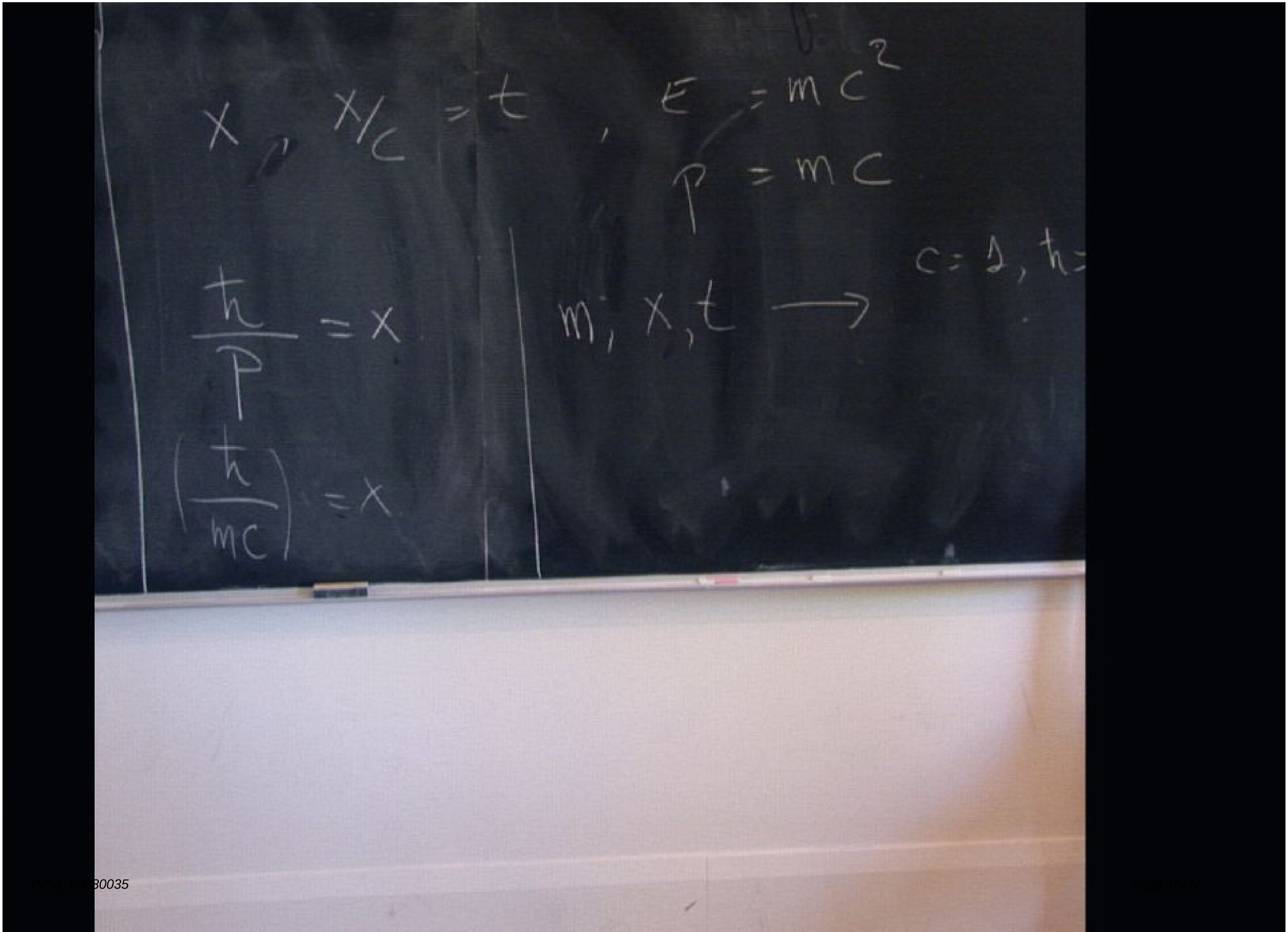
e⁻
p+
e⁻
p+


ħ = c = 1
3
cm.

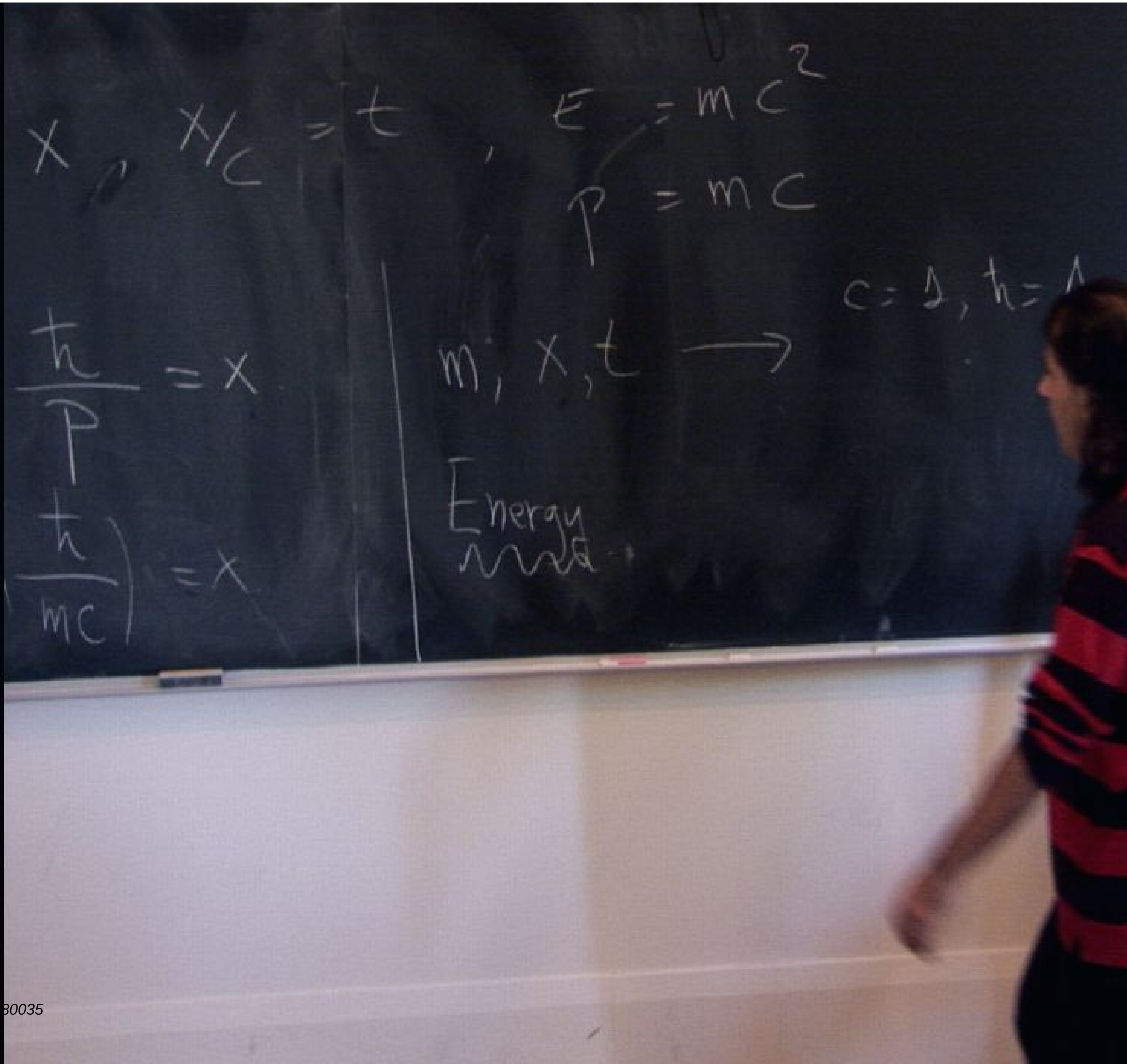

c = 1
x , x/c = t
E = mc²
p = mc

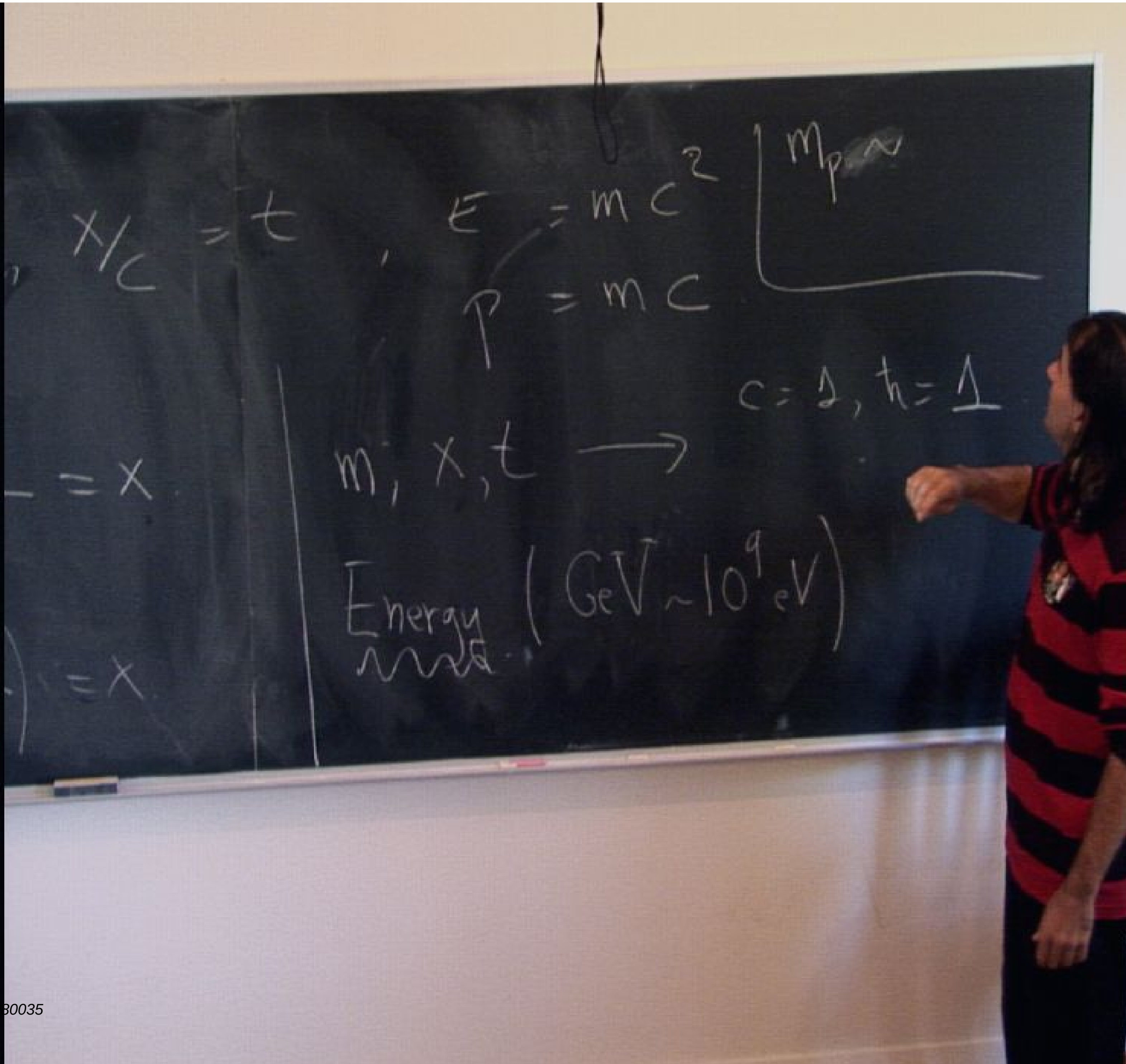

ħ = c = 1
x , x/c = t , E = m
P = m
ħ/P = x


$\hbar = c = 1$
$x, \; x/c = t$
$E = m$
$P = m$
$\frac{\hbar}{P} = x$
$\frac{\hbar}{mc} = x$

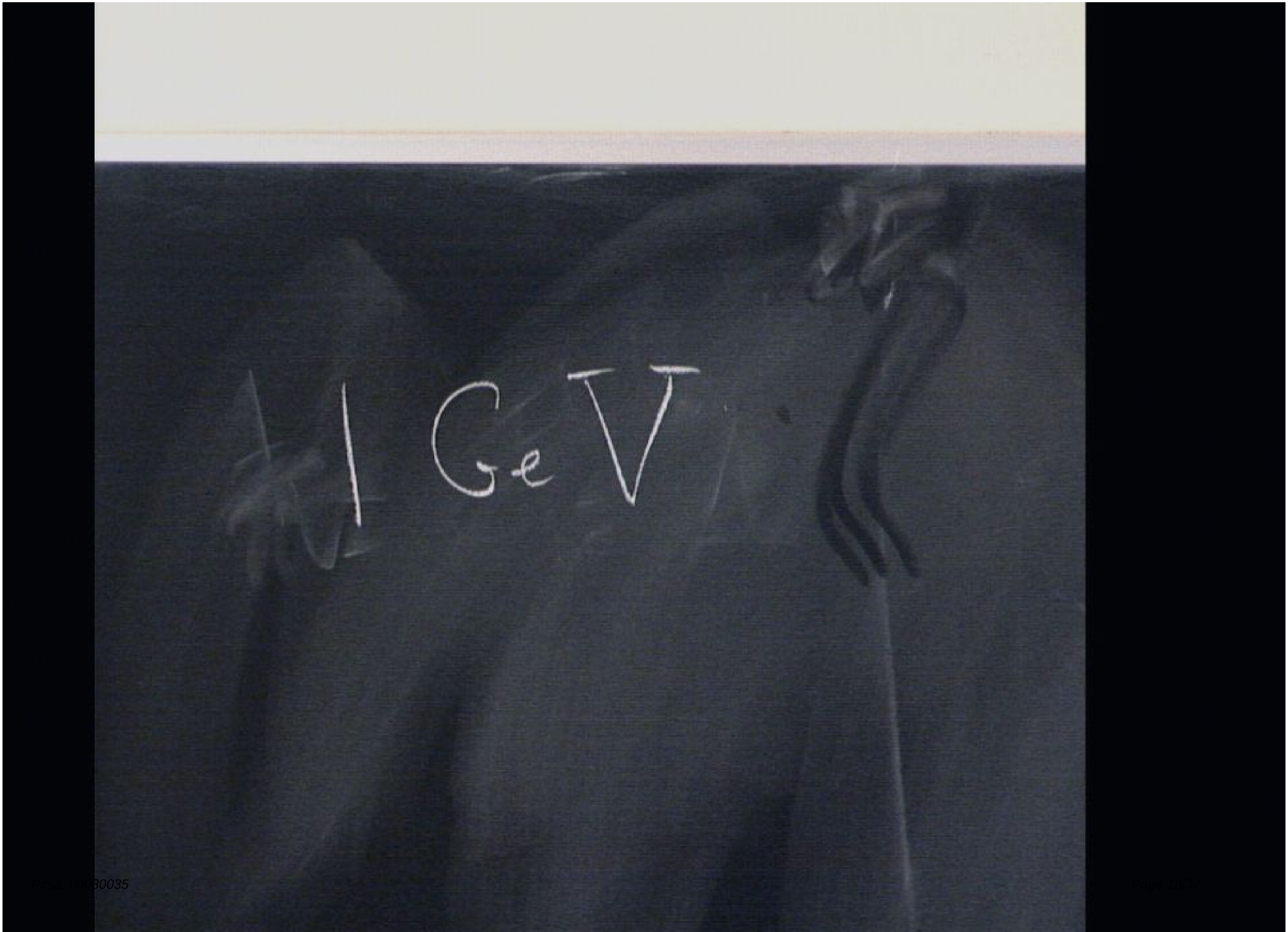


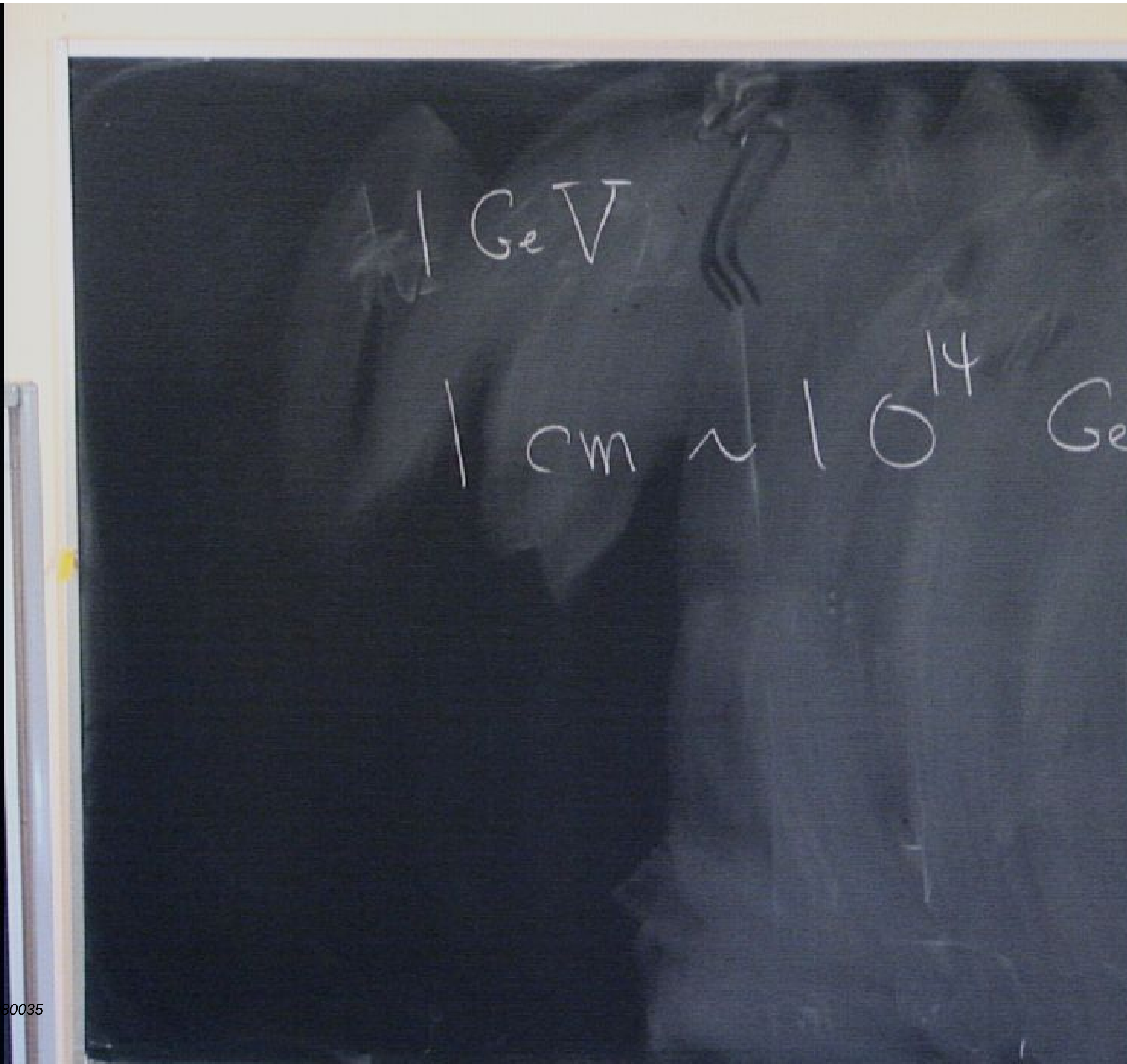
x , x/c = t
E = mc²
P = mc
c = 1, ħ =
ħ/P = x
m, x, t ⟶
(ħ/mc) = x

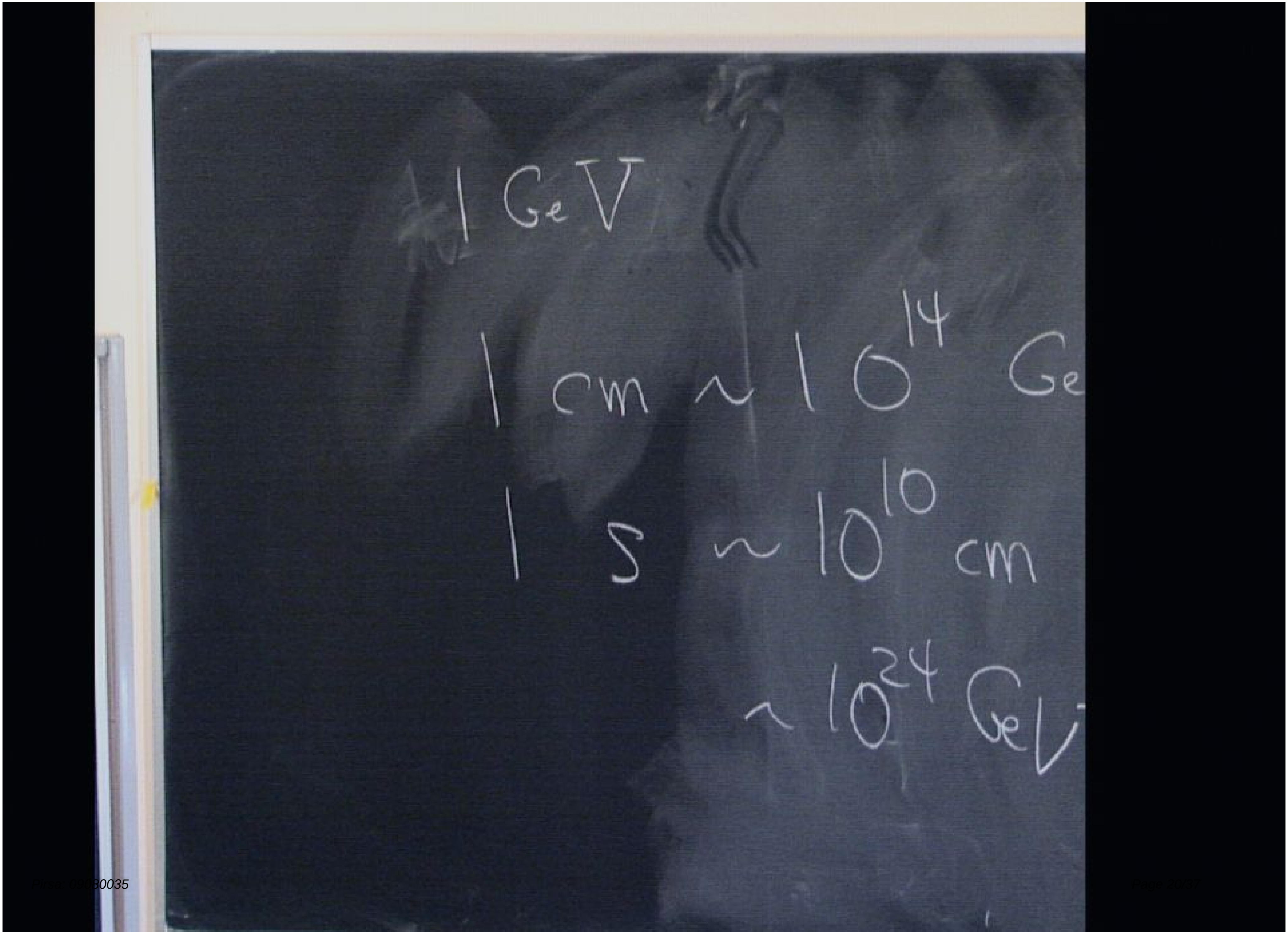

x , x/c = t , E = mc²
p = mc
c = 1, ħ = 1
ħ/p = x
m, x, t ⟶
(ħ/mc) = x
Energy

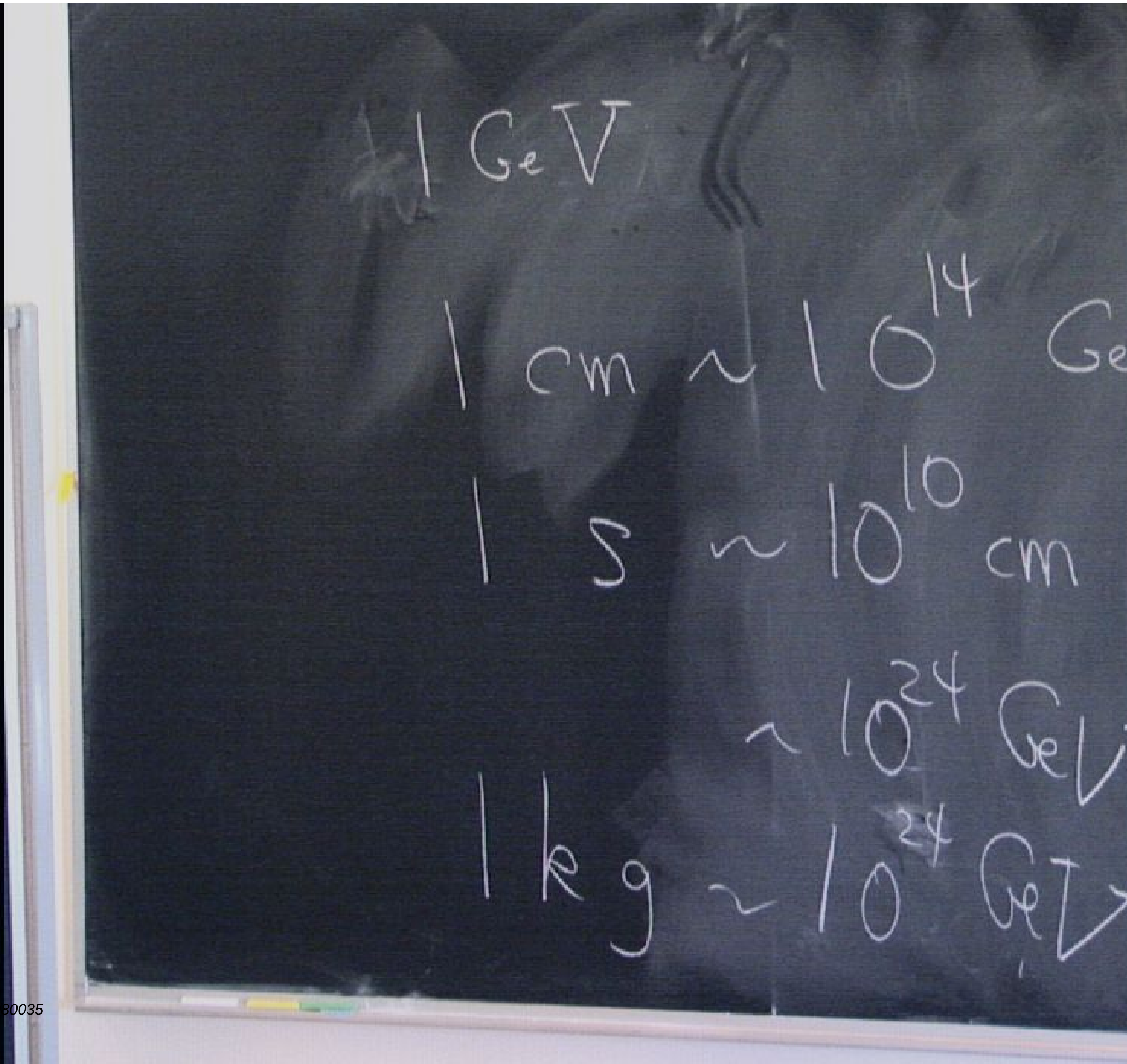


X/c = t
E = mc²
m_p ~
p = mc
c = 1, ħ = 1
m, x, t ⟶
Energy (GeV ~ 10⁹ eV)
= x
= x

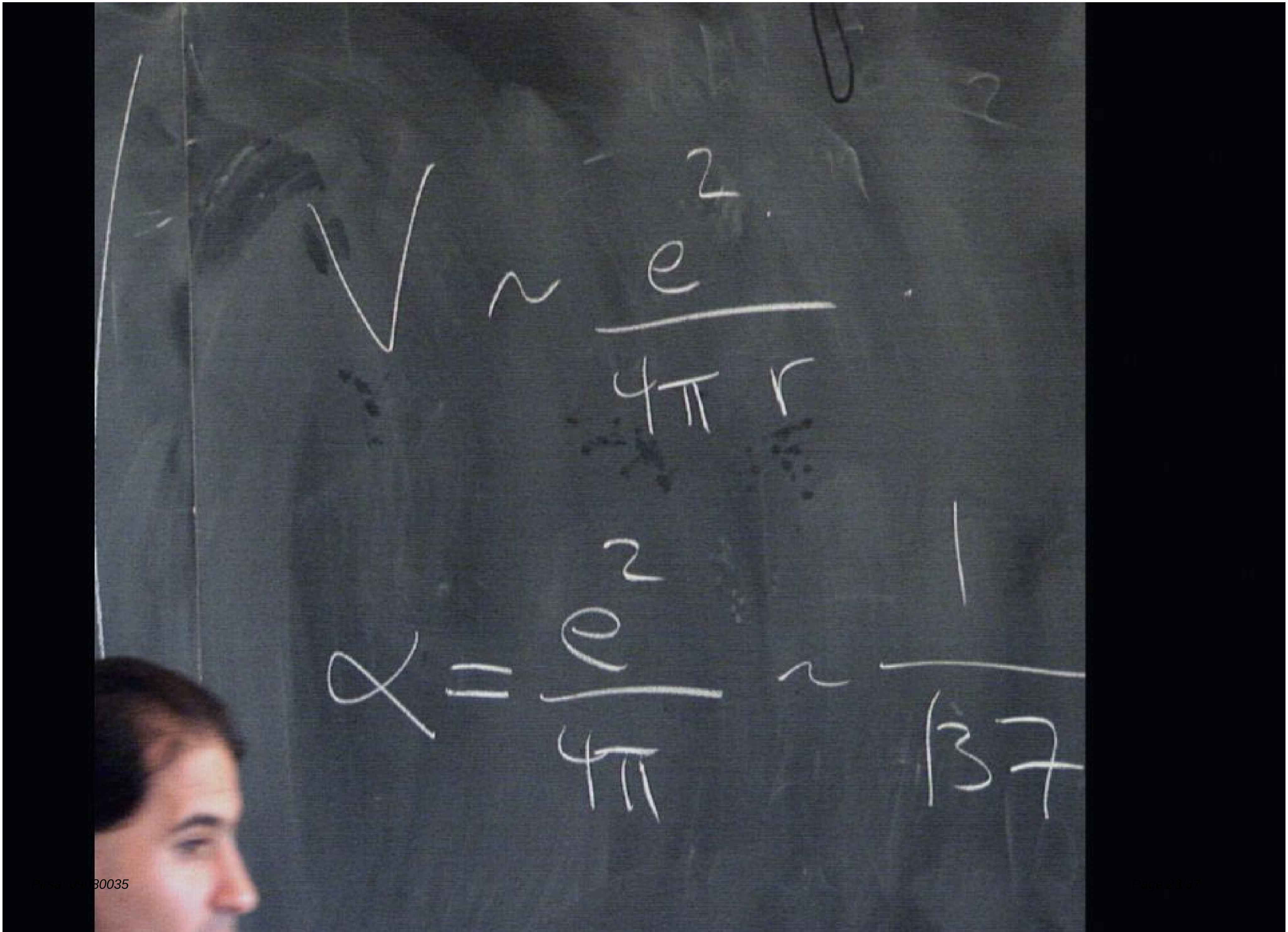

1 GeV

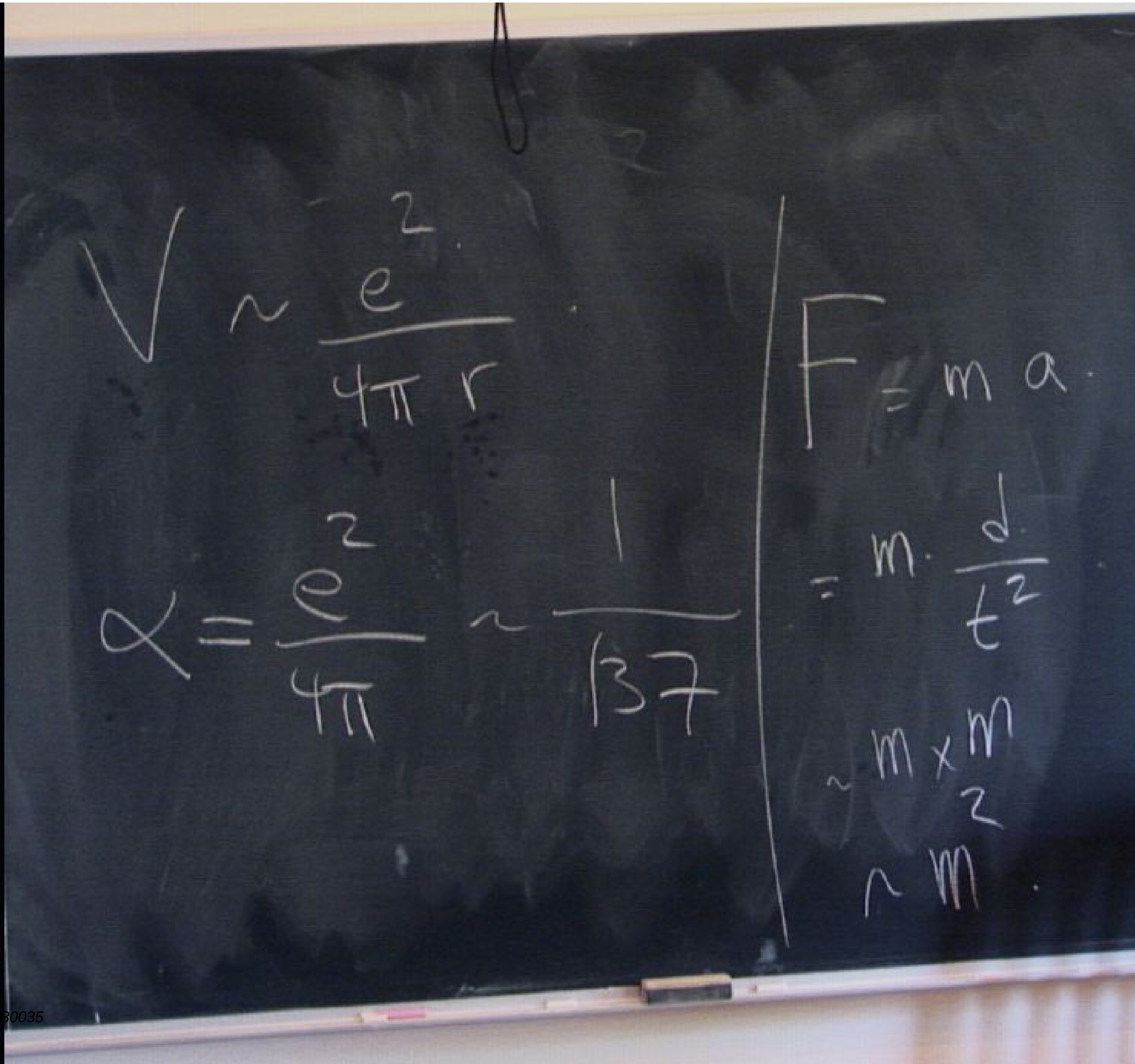

~ 1 GeV
1 cm ~ 10^14 Ge

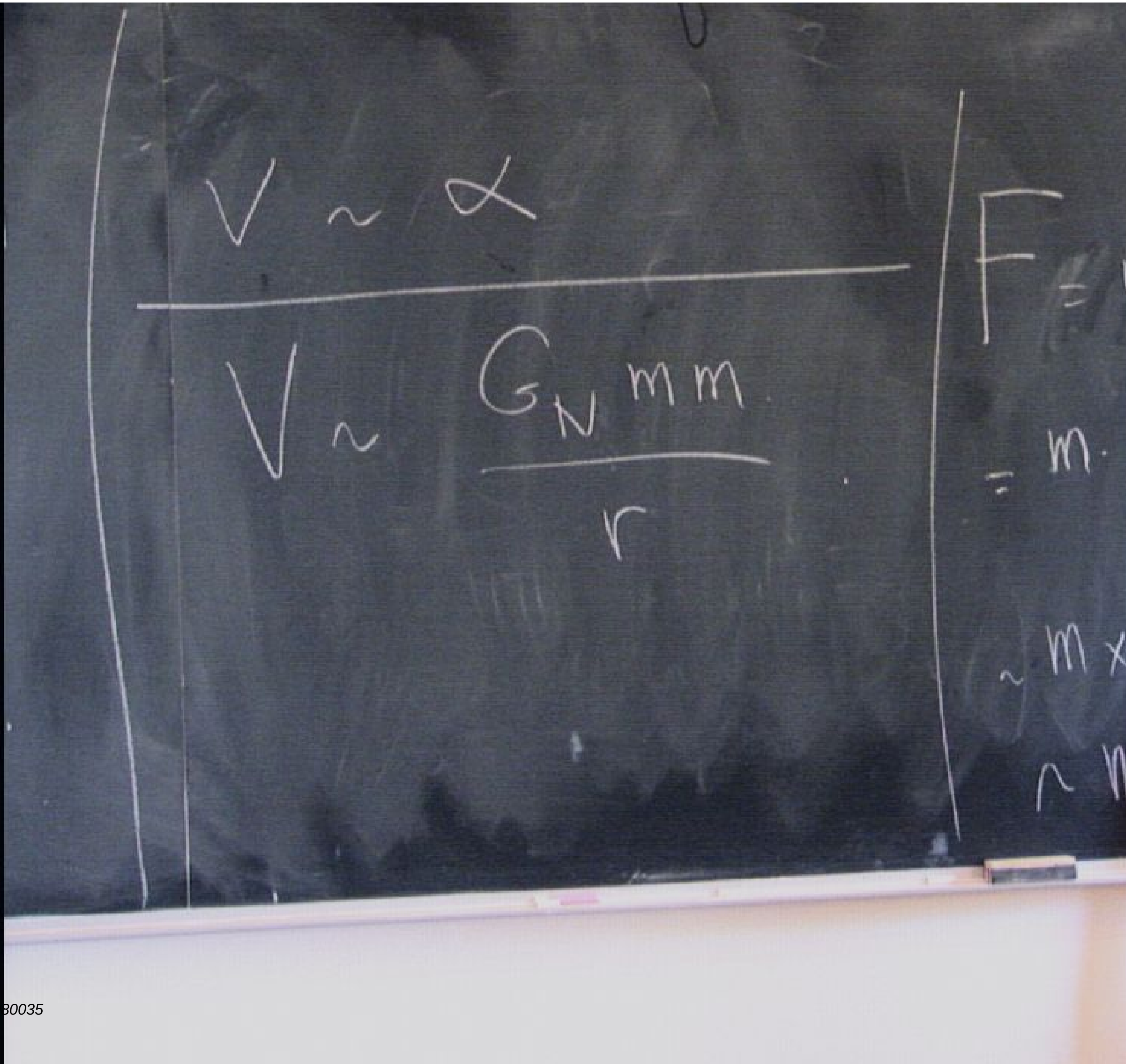

1 GeV
1 cm ~ 10^14 Ge
1 s ~ 10^10 cm
~ 10^24 GeV

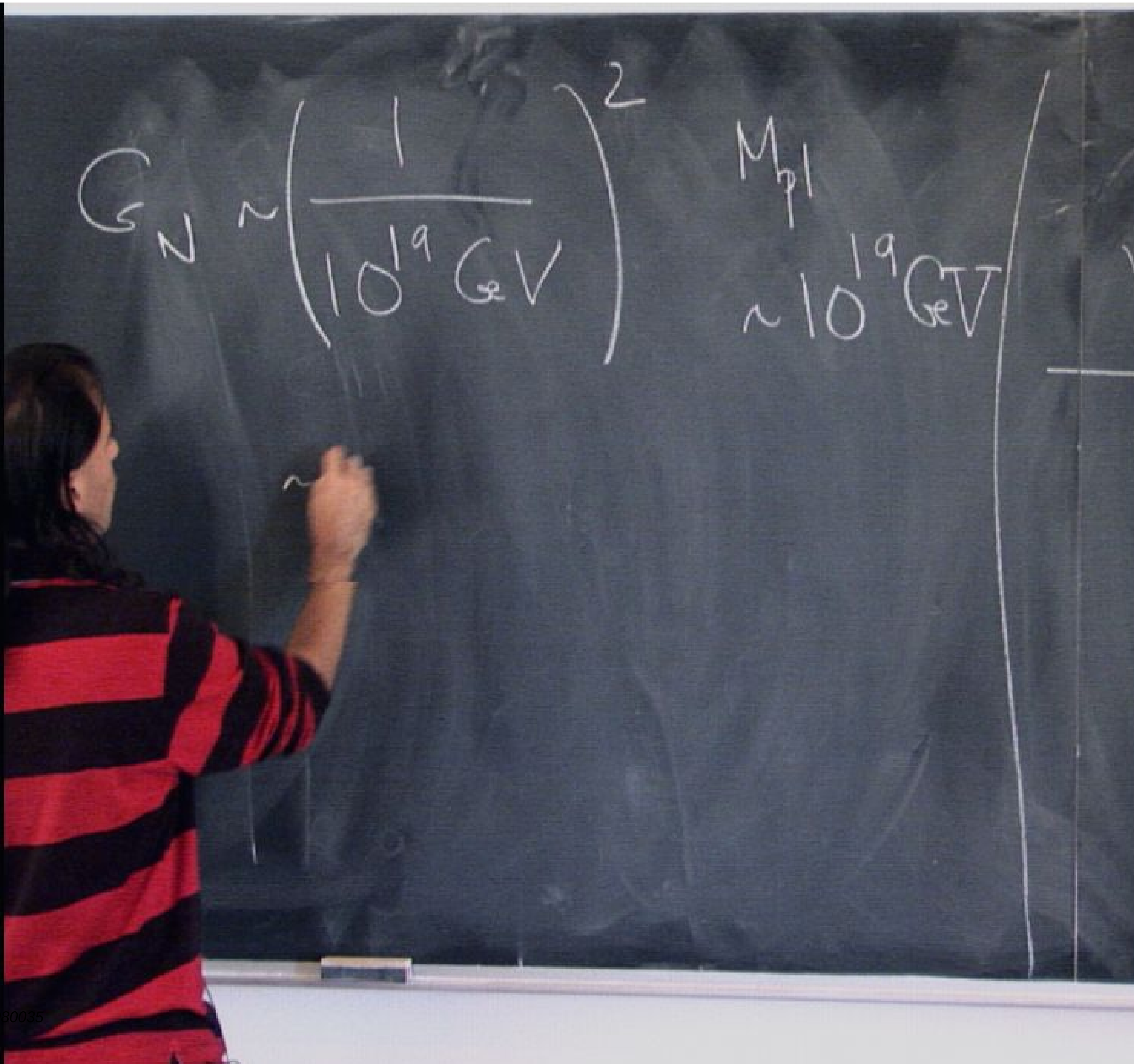

1 GeV
1 cm ~ 10^14 Ge
1 s ~ 10^10 cm
~ 10^24 GeV
1 kg ~ 10^24 GeV

$$V \sim \frac{e^2}{4\pi r}$$


$V \sim \frac{e^2}{4\pi r}$
$\alpha = \frac{e^2}{4\pi} \sim \frac{1}{137}$


V ~ e^2 / 4π r
α = e^2 / 4π ~ 1 / 137
F = m a
= m · d / t^2
~ m × m
~ m^2

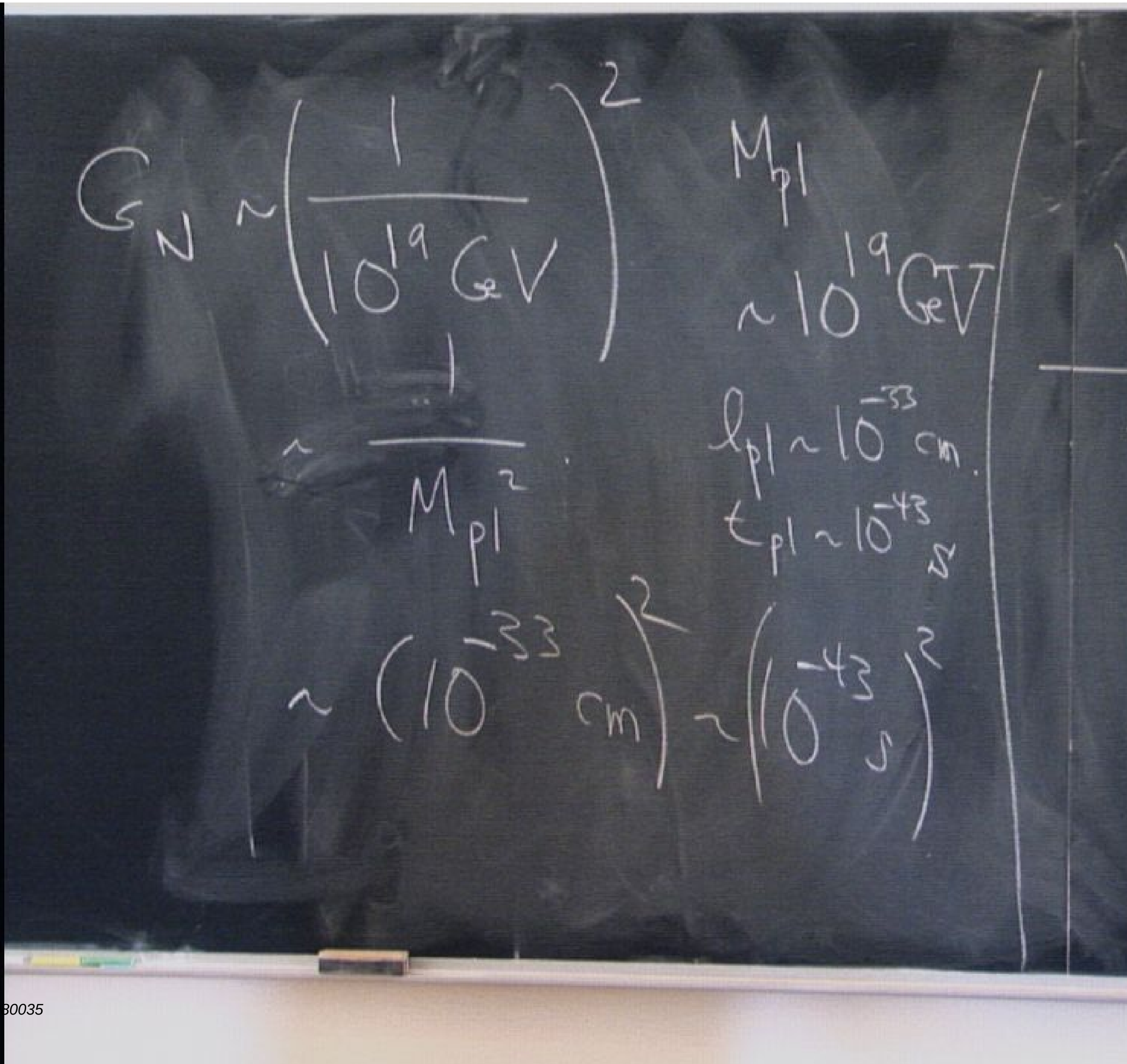

V ~ α
V ~ G_N mm / r
F =
= m.
~ m x
~ m



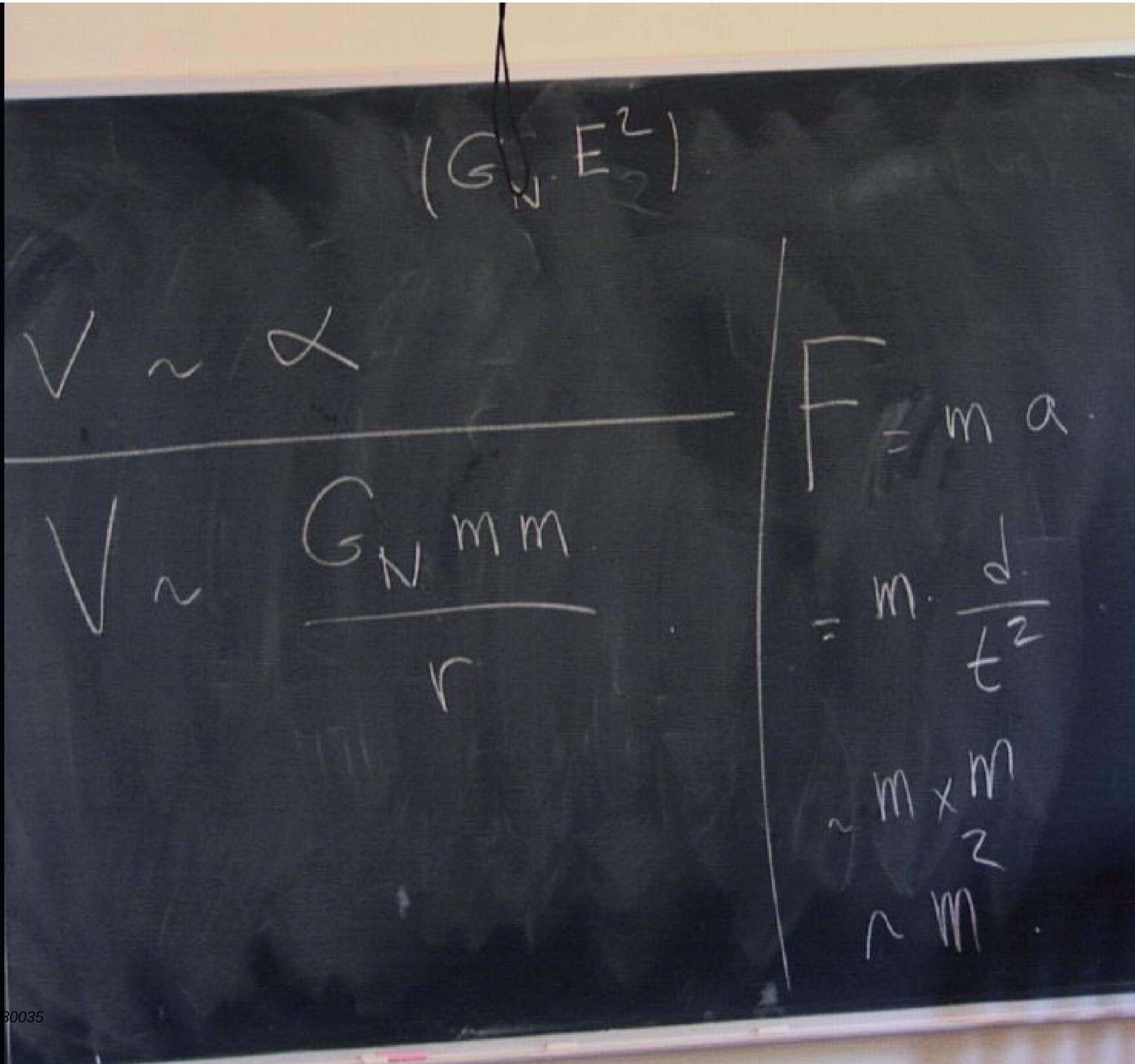
$G_N \sim \left(\frac{1}{10^{19}\,GeV}\right)^2$
M_{pl}
$\sim 10^{19}\,GeV$

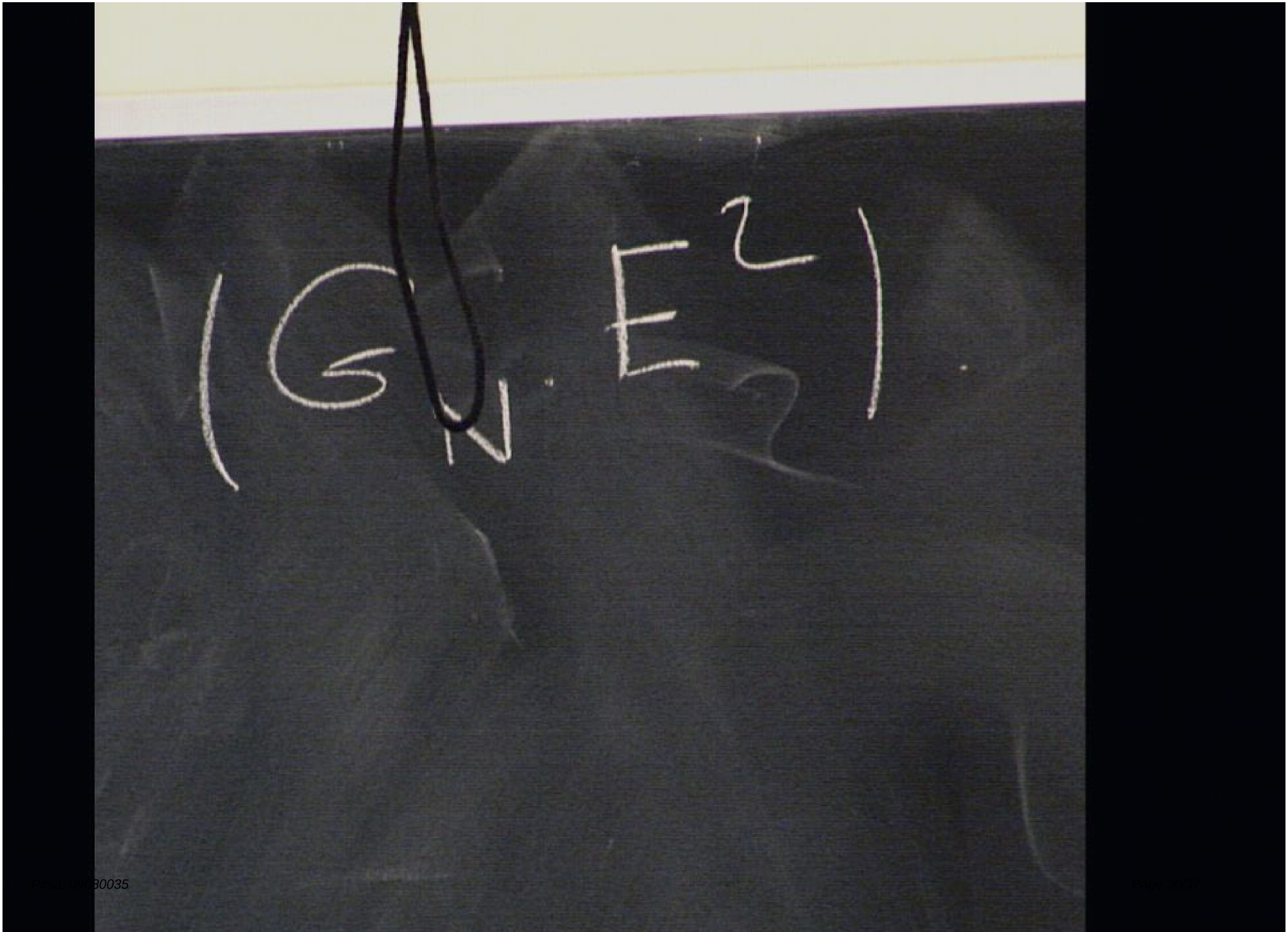
$$G_N \sim \left(\frac{1}{10^{19}\,\mathrm{GeV}}\right)^2 \sim \frac{1}{M_{pl}^2} \sim \left(10^{-33}\,\mathrm{cm}\right)^2$$

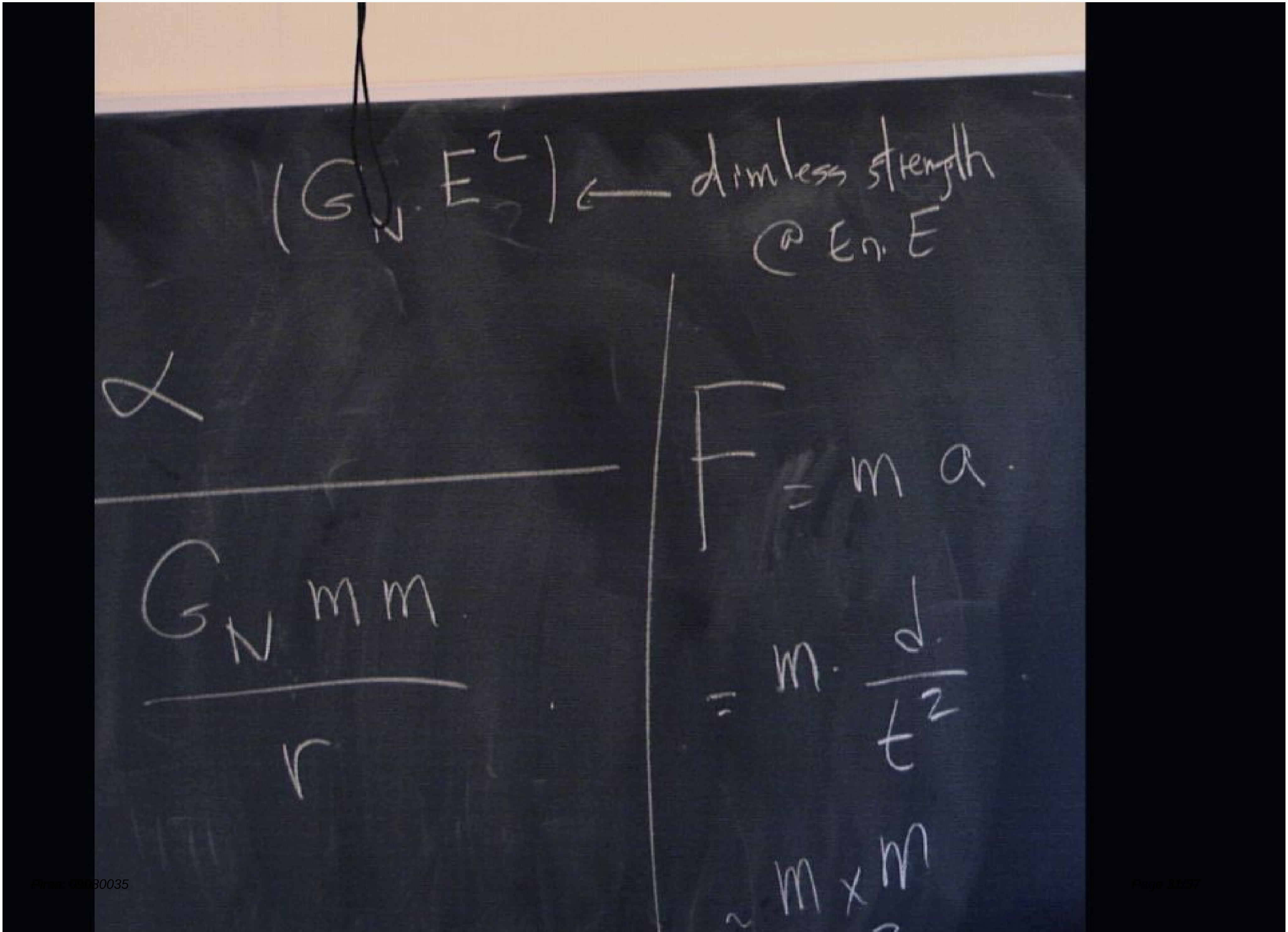
$M_{pl} \sim 10^{19}\,\mathrm{GeV}$



G_N ~ (1 / 10^19 GeV)^2 ~ 1 / M_pl^2
~ (10^-33 cm)^2 ~ (10^-43 s)^2
M_pl ~ 10^19 GeV
l_pl ~ 10^-33 cm.
t_pl ~ 10^-43 s


($G_N \cdot E^2$)
$V \sim \alpha$
$V \sim \frac{G_N m m}{r}$
$F = m a$
$= m \cdot \frac{d}{t^2}$
$\sim m \times \frac{m}{2}$
$\sim m^2$


$(G_N \cdot E^2)$.



(G_N · E^2) ← dimless strength
@ En. E
α
G_N mm / r
F = m a.
= m · d / t^2
~ m × m

$$M_p \sim \text{GeV}$$

$$G_N \sim \frac{1}{M_{pl}^2}, \quad M_{pl} \sim 10^{19}\ \text{GeV}$$

$m_p \sim \text{GeV}$

$G_N \sim \frac{1}{M_{pl}^2}, \quad M_{pl} \sim 10^{19}\ \text{GeV}$

$\alpha \sim \frac{1}{137}$

m_p ...

$$G_N \sim \frac{1}{M_{pl}^2}, \quad M_{pl} \sim 10^{19}\ \mathrm{GeV}$$

$$\alpha \sim \frac{1}{137}$$

m_e

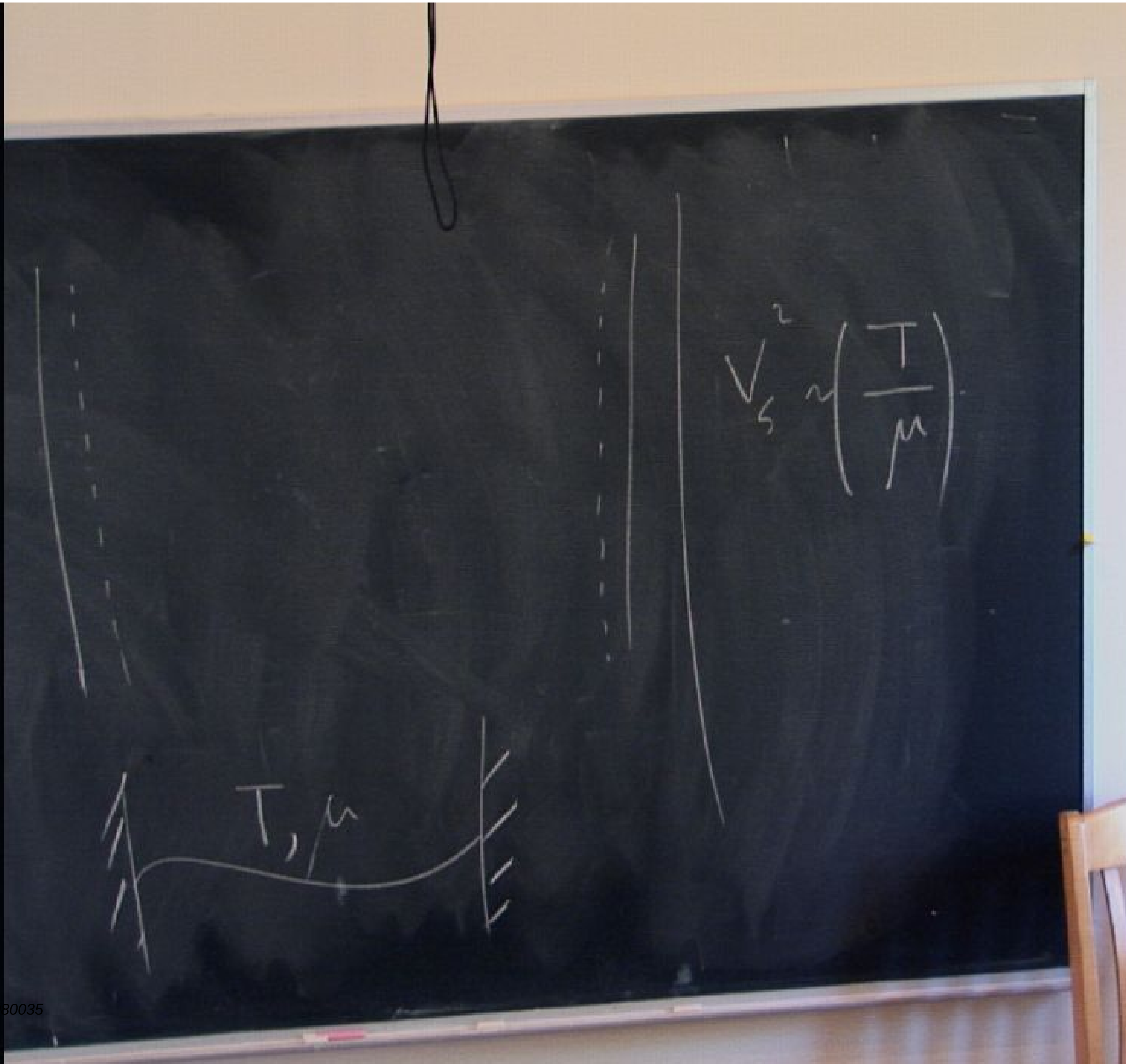
m_π

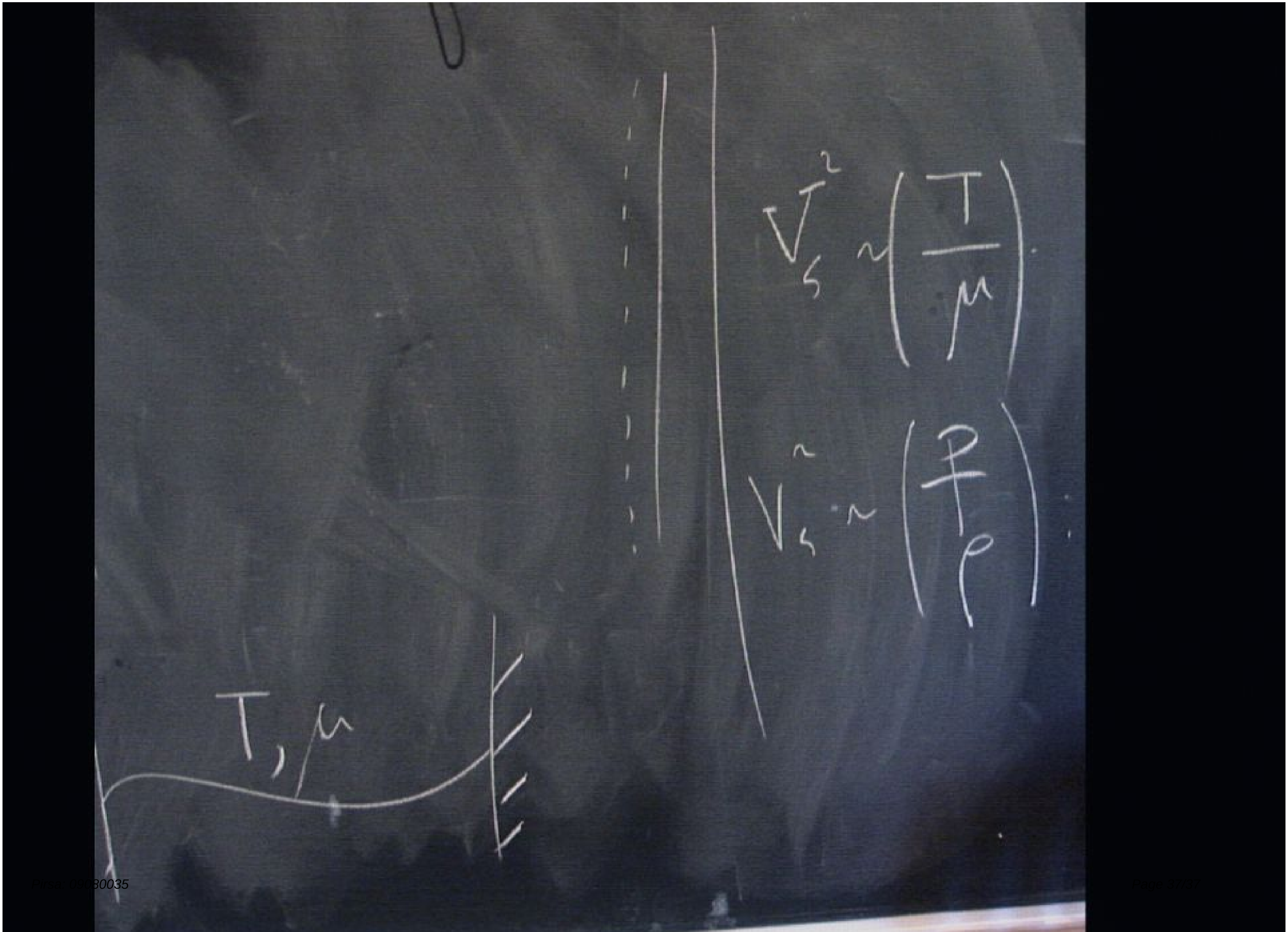
$$G_N \sim \frac{1}{M_{pl}^2}, \quad M_{pl} \sim 10^{19}\ \text{GeV}$$

$$\alpha \sim \frac{1}{137}$$

$$m_e \sim 10^{-3}\ \text{GeV}$$

$$m_\pi \sim 10^{-1}\ \text{GeV}$$


$V_s^2 \sim \left(\frac{T}{\mu}\right)$
T, μ


$V_s^2 \sim \left(\frac{T}{\mu}\right)$
$V_s^2 \sim \left(\frac{P}{\rho}\right)$
T, μ