D.E. from inf. & EWSB

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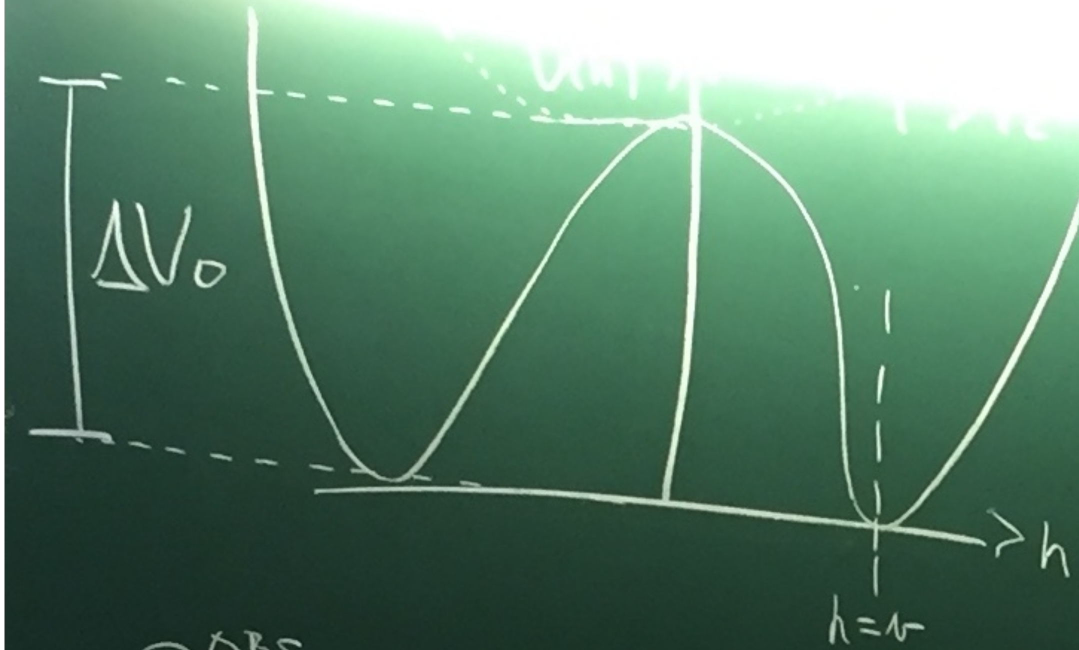
1904.00045
with
K.D. ; J-E.C-M., P.S

- $M_P^2 G_{\mu\nu} = T_{\mu\nu} - g_{\mu\nu} \rho_\Lambda$

  ; $\rho_\Lambda \equiv \Lambda_0 M_P^2 +$ Vacuum Energies

- $\rho_\Lambda^{OBS} \sim 2{,}5 \cdot 10^{-47}\ \mathrm{GeV}^4 \lll$ Vac. Ener.

- F.T. <u>NOT</u> $\mathcal{O}(10^{120})$



$$V(h) = \frac{\lambda}{4}\left(h^2 - v^2\right)^2 + \dots$$

$$\begin{cases} V(0) = \frac{\lambda}{4} v^4 \\ V(h=v) = 0 \end{cases}$$

$$\frac{\rho_\Lambda^{OBS}}{\Lambda} \sim \frac{10^{-47}}{10^{8}} \sim 10^{-55} \quad ; \quad \text{Assume } \underline{\Lambda = 0}$$

- ρ_Λ is from ϕ $\xrightarrow{F.T.}$

1) in. cond.
2) $m_\phi \sim 10^{-33}\,eV$
3) $\lambda_\phi \sim 0$

- R^2 - inf.

$M_p \equiv 1$

$$S = \int d^4x \sqrt{-g} \left[\frac{R}{2} + \frac{\alpha^{-2}}{16} R^2 - V(h) \right]$$

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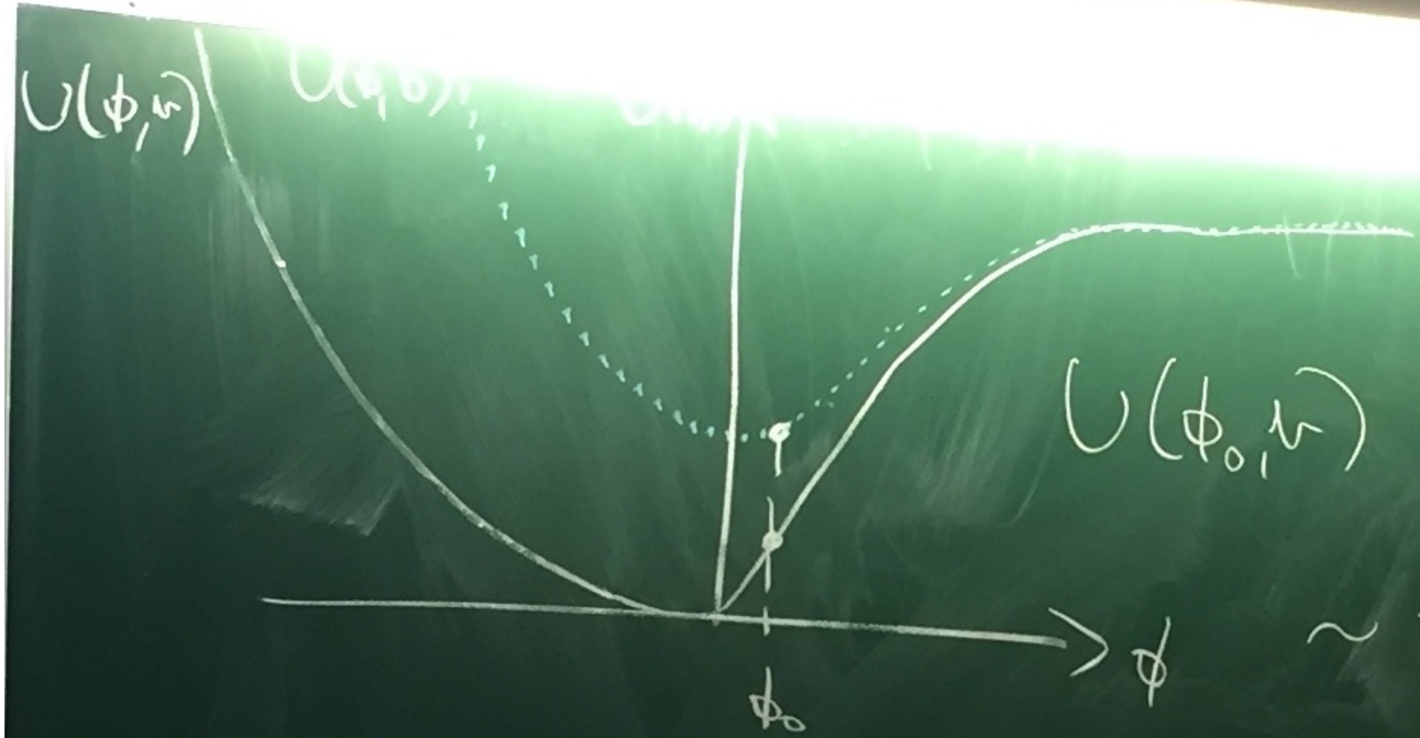
; $g_{\mu\nu} \longrightarrow \Omega^2 g_{\mu\nu}$ ...

$$\Rightarrow S = \int d^4x \sqrt{-g} \left[\frac{R}{2} - \frac{1}{2}(\partial_\mu \phi)^2 - \alpha^2 \left(1 - e^{-\sqrt{2/3}\phi}\right)^2 - e^{-\sqrt{8/3}\phi} V(h) \right]$$

$$\begin{cases} = e^{-\sqrt{8/3}\phi} \frac{\lambda}{4} v^4 & ; h = 0 \\ = 0 & ; h = v \end{cases}$$



$$U(\phi_0, v) = \frac{\lambda^2 v^8}{16 \alpha^2 M_p^4} \sim \frac{1}{6} \rho_\Lambda^{0.25}$$

$$\boxed{\rho_\Lambda \approx \frac{v^8}{P_5 M_p^4}} \quad ; \quad \left(\sqrt{\rho_\Lambda^{1/4} M_p} \sim v \right)$$

$$m_\phi \sim 10^{13}\ \mathrm{GeV}$$

- Model $(\partial_\mu \phi)^2$

$$(\partial_\mu \phi)^2 \longrightarrow \left[1 + \frac{M_P^2}{\phi^2}\right](\partial_\mu \phi)^2$$

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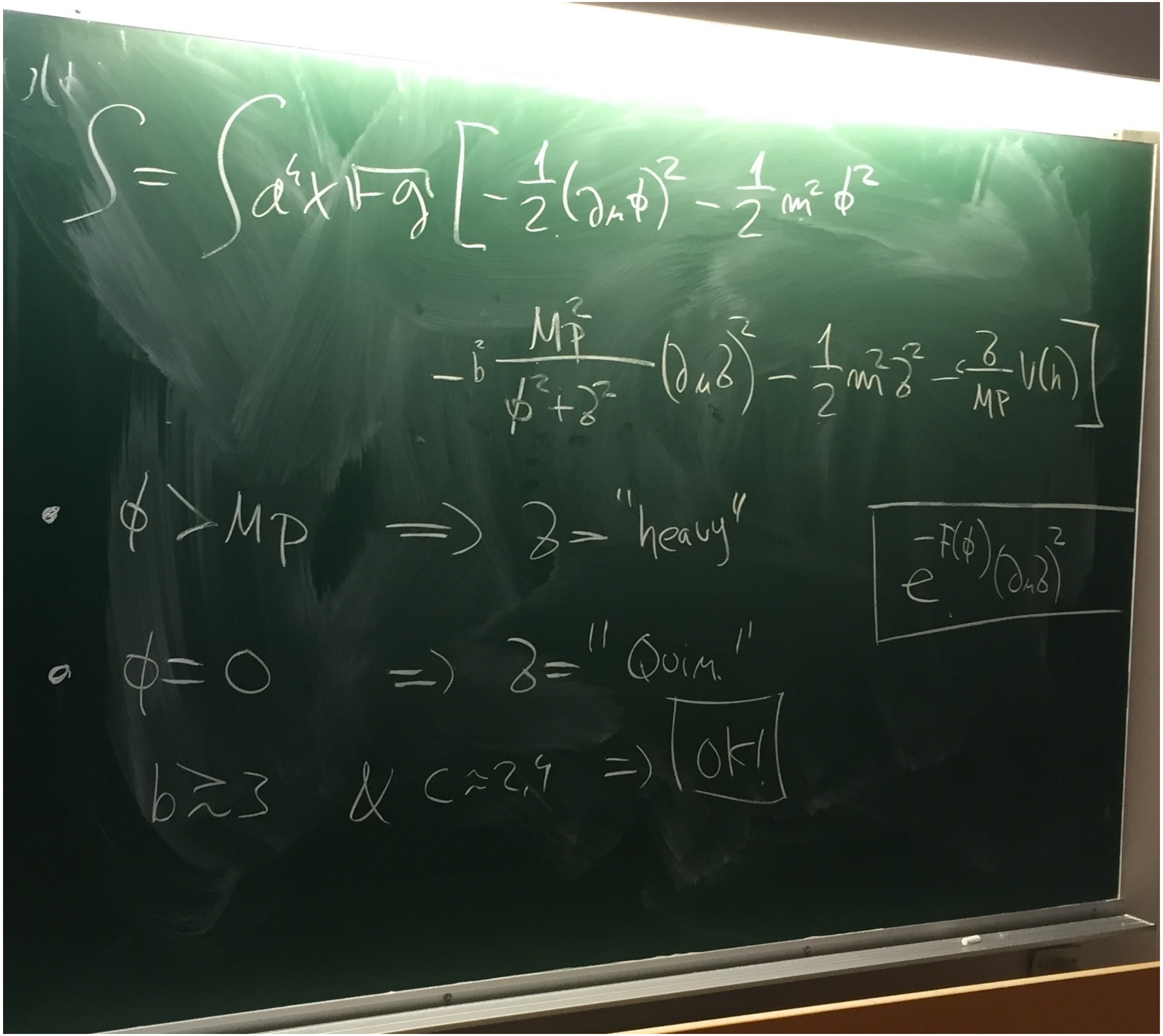
- $V(\phi_0, \mu) \sim \rho_\Lambda$; $V''(\phi_0, \nu) \simeq \frac{\rho_\Lambda}{M_P} \sim H_0^2$

- $\phi \longrightarrow \phi_0$ hard!

- 2 fields! ϕ & χ (inf. "darkon")



$S = \int d^4x \sqrt{-g}\,\Big[-\frac{1}{2}(\partial_\mu \phi)^2 - \frac{1}{2} m^2 \phi^2$
$- b^2 \frac{M_P^2}{\phi^2 + z^2} (\partial_\mu z)^2 - \frac{1}{2} m^2 z^2 - c \frac{z}{M_P} V(h) \Big]$
• $\phi \gg M_P \Rightarrow z =$ "heavy"
• $\phi = 0 \Rightarrow z =$ "Quin."
$b \gtrsim 3$ & $c \simeq 2{,}4 \Rightarrow$ OK!
$e^{-F(\phi)} (\partial_\mu z)^2$