Reheating After Axion Inflation

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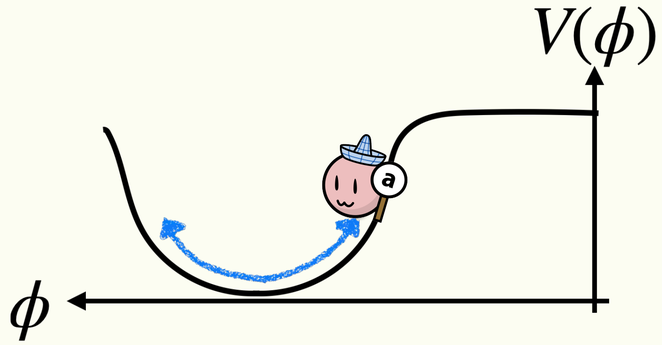
[2503.01228, JCAP07(2025)002]

KEK

SOKENDAI

Reheating and its problem



Inflaton condensate

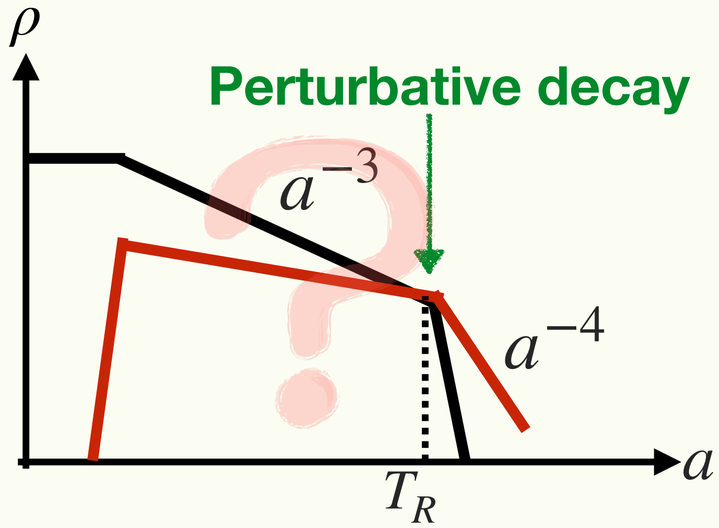
Decay

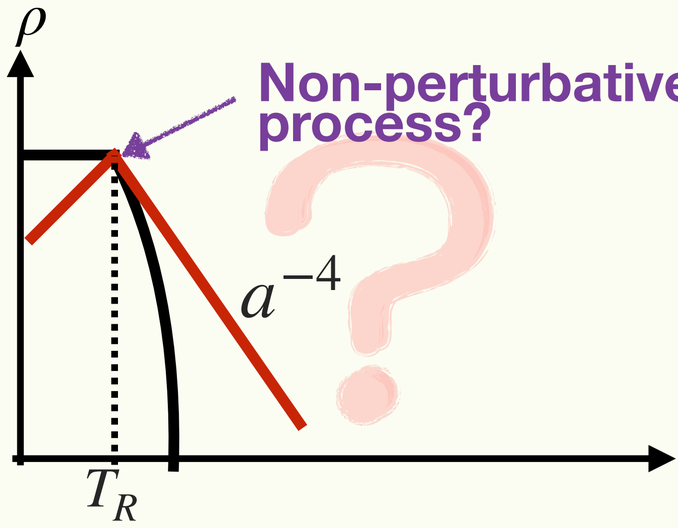
Reheating

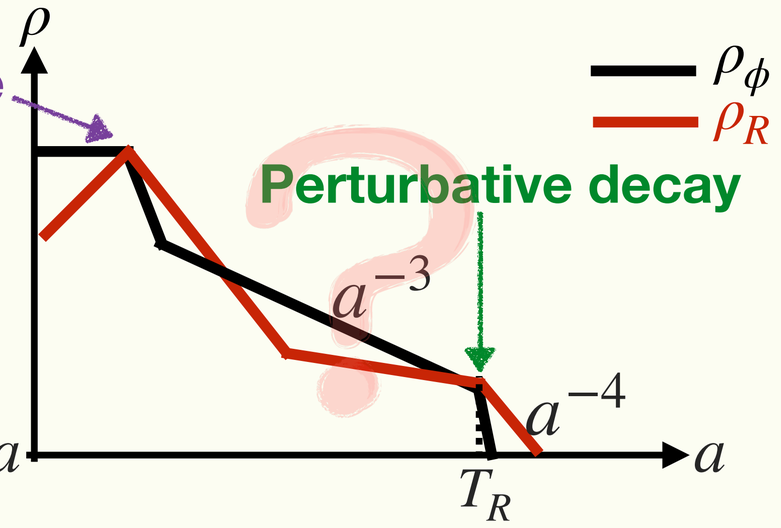
Radiation

thermal equil.

- **How to complete?**







Reheating After Axion Inflation

- **Axion coupled to SU(N) gauge sector**

$$\mathscr{L} = \frac{1}{2}\partial_\mu\phi\partial^\mu\phi - V(\phi) - \frac{1}{4}G^c_{\mu\nu}G^{c\mu\nu} - \phi\frac{1}{8\pi\Lambda}G^c_{\mu\nu}\tilde{G}^{c\mu\nu} + \mathscr{L}_{\rm other}$$

①Amplification of the gauge field due to instability!

$$\left(\partial_\tau^2 + k^2 \pm \frac{1}{2\pi\Lambda}\frac{\dot{\phi}}{H}\frac{k}{\tau}\right)A_k^\pm = 0$$

②Dissipation of Inflaton condensate ϕ

$$\ddot{\phi} + 3H\dot{\phi} + \Gamma_\phi(T)\dot{\phi} + m_\phi^2\phi = 0$$

w/ $\Gamma_\phi \sim \dfrac{\alpha^3 T^3}{\Lambda^2}$

The compleation of Reheating after axion inflation is non-trivial!

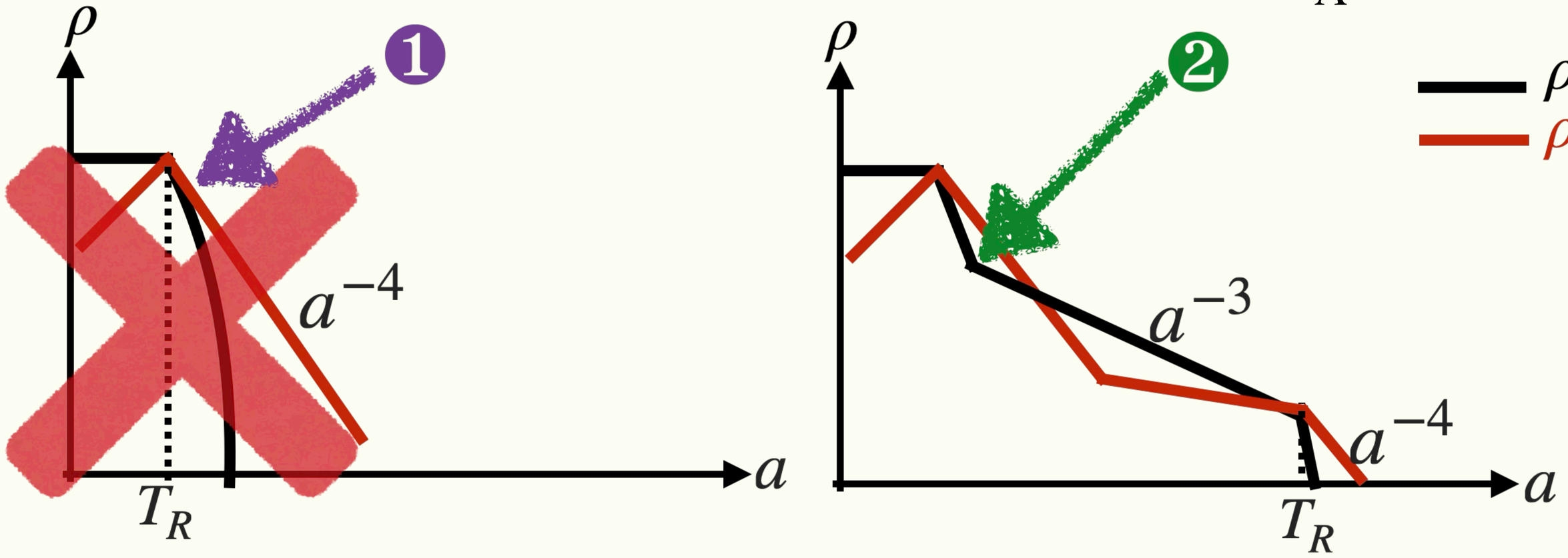
Reheating Analysis

[T.Fujita, K.Mukaida, **TT** :2503.01228]

Key point

① Thermal mass m_M suppresses the tachyonic instability.

② Inflaton particle production from the thermal bath! $\Gamma_{\delta\phi} \sim \alpha \dfrac{T^3}{\Lambda^2}$

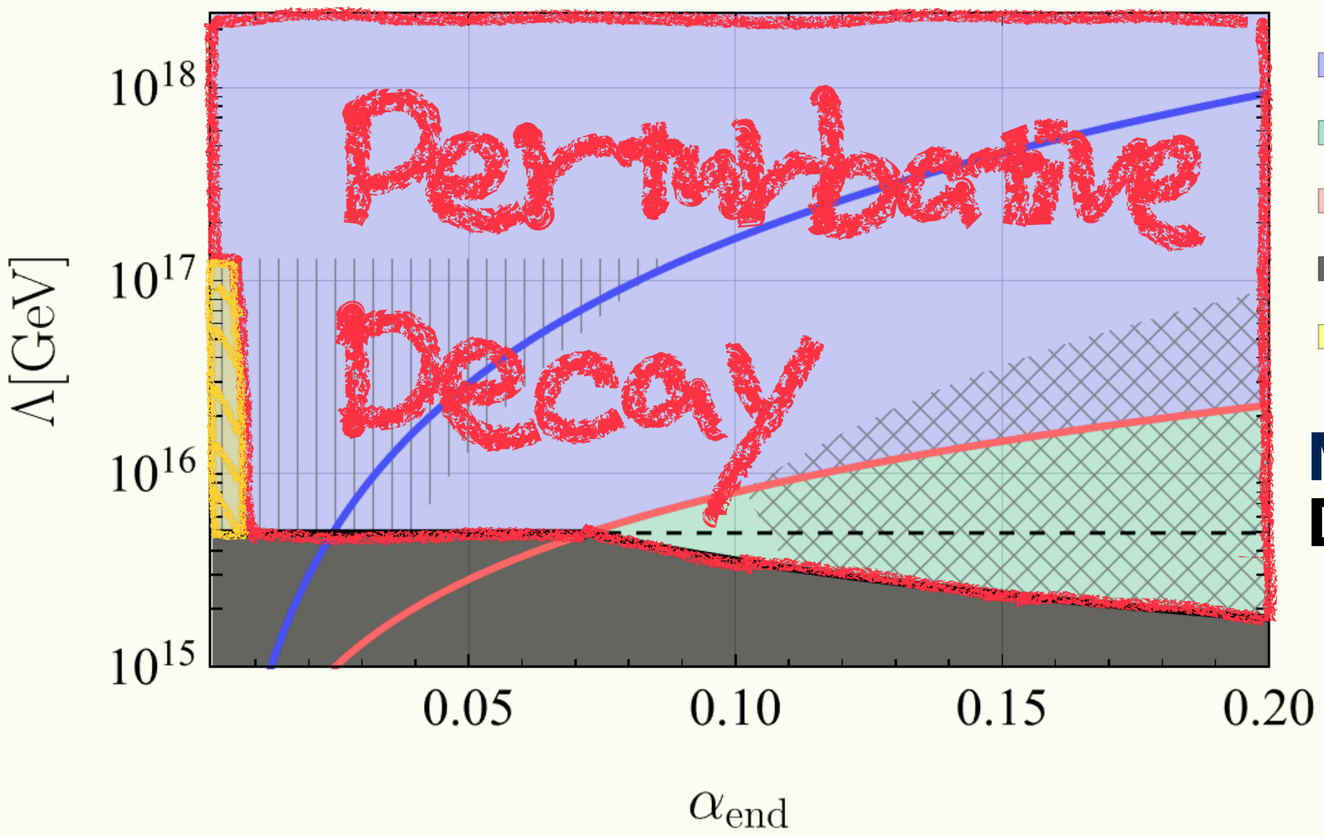


Results and Conclutions

[T.Fujita, K.Mukaida, **TT** :2503.01228]

The completion of reheating after the axion inflation

$$V(\phi) = \frac{m_\phi^2}{2}\phi^2, N = 3, m_\phi = 10^{13}\ \mathrm{GeV}, g_* = 30$$



Main Message
Don’t overlook perturbative reheating!

For more details, see [2503.01228] and my poster!