SUSY+Inflation

Marine Samsonyan

Les Houches, November 4–6

SUSY+Inflation

There are flat directions.

In global SUSY the order parameter of supersymmery breaking is associated to the vacuum energy density.

SUSY naturally gives an inflaton.

In local SUSY the gravitino mass is the order parameter.

Spontaneous breaking of SUSY predicts the existence of a massless goldstino which is eaten by the gravitino and becomes its longitudinal part.

The general properties of the SUSY breaking can be analyzed by the Komargodski-Seiberg presentation. Their starting point is the Ferrara-Zumino multiplet $\mathcal{J}_{\alpha\dot{\alpha}}$

$$\mathcal{J}_\mu = |_\mu + \theta^\alpha \mathcal{S}_{\mu\alpha} + \bar{\theta}_{\dot{\alpha}} \bar{\mathcal{S}}_\mu^{\dot{\alpha}} + \in \theta \sigma^\nu \bar{\theta} \mathcal{T}_{\mu\nu} + \ldots$$

$$X = \phi_X + \sqrt{2}\theta\psi + \theta^2 F$$

$$\psi_\alpha = \frac{\sqrt{2}}{3} \sigma^\mu_{\alpha\dot{\alpha}} \bar{S}^{\dot{\alpha}}_\mu, \quad F = \frac{2}{3} T + i\partial_\mu j^\mu$$

$$\mathcal{J}_{\alpha\dot{\alpha}} = -\in \sigma^\mu_{\alpha\dot{\alpha}} \mathcal{J}_\mu$$

$$\bar{D}^{\dot{\alpha}} \mathcal{J}_{\alpha\dot{\alpha}} = D_\alpha X$$

X-chiral superfield containing order parameter of SUSY breaking and the goldstino field.

$$X^{UV} \to X^{IR}_{NL}$$
$$X^2_{NL} = 0$$
$$X_{NL} = \frac{G^2}{2F} + \sqrt{2}\theta G + \theta^2 F$$

$$f = 10^{11-13} Gev, \quad N \approx 110, \quad 10^7 < T_R < 10^9$$

- *Consider multifield (interacting?) inflation.*
  Coupling to matter multiplets in KZ.

$$X_{NL} Q_{NL} = 0$$

$$q \to \frac{\psi_q G}{F} - \frac{G^2}{2F^2} F_q$$

  removes the heavy squark (true for any other fermion).
- *Considering the microscopic model of goldstino and sgoldstino fields to matter fields compute the reheating temperature.*

- *Find V for X or ϕ_x in the presence of matter superfields.*

$$\phi_x = 4W - \frac{4}{3} K^i (K^{-1})^j{}_i W_j$$

  when gravitino couplings are dominated by goldstino interactions.
- *See how the slow-roll conditions translate into conditions on W and K in the context of supergravity.*

Thank you