Creation and time evolution of particle number asymmetry in an expanding universe with interactions

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Production mechanism for matter and anti-matter. Some Scenarios: Baryogenesis, leptogenesis

Our work: udy how creation and ution of particle numb

Their interactions: CP violating & particle number violating The initial distribution of scalar fields - thermal equilibrium



We calculate the contribution of the expectation value of particle number asymmetry from GF and from scalar fields.



The solutions: integral equations form Using perturbation methods, the solutions is expanded as series of

We derive Schwinger Dyson equations for GF and scalar fields from 2PI CTP EA



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Results: The current up to the first order $O(A^1)$

$$\begin{pmatrix} a(x^{0}) \\ a_{0} \end{pmatrix}^{3} \langle j_{0}(x^{0}) \rangle = -\frac{1}{2} \bar{\varphi}_{1,\text{free}}^{T}(x^{0}) \tau^{1} \overleftrightarrow{\partial}_{\mu} \bar{\varphi}_{2,\text{free}}(x^{0}) + \frac{1}{2} \int \frac{d^{3}k}{(2\pi)^{3}} \left(\frac{\partial}{\partial x^{0}} - \frac{\partial}{\partial y^{0}} \right) [\hat{G}_{12,x^{0}y^{0},\text{int}}^{12}(\mathbf{k}) - \hat{G}_{21,x^{0}y^{0},\text{int}}^{12}(\mathbf{k})]|_{y^{0} \to x^{0}} + \frac{1}{2} [\bar{\varphi}_{2,\text{int}}^{T}(x^{0}) \tau^{1} \dot{\varphi}_{1,\text{free}}(x^{0}) - \bar{\varphi}_{1,\text{int}}^{T}(x^{0}) \tau^{1} \dot{\varphi}_{2,\text{free}}(x^{0})] + \frac{1}{2} [\bar{\varphi}_{2,\text{free}}^{T}(x^{0}) \tau^{1} \dot{\varphi}_{1,\text{int}}(x^{0}) - \bar{\varphi}_{1,\text{free}}^{T}(x^{0}) \tau^{1} \dot{\varphi}_{2,\text{int}}(x^{0})]$$
(1)

 $\Rightarrow \bar{\varphi}_{1,\text{int}}^T(x^0)\bar{\varphi}_{1,\text{int}}(x^0)$ is second order $o(A^2)$ and free part of Green's function is diagonal, they will not contribute to the current density.

More details, I will talk in the poster session later. Please come!

THANK YOU!



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