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

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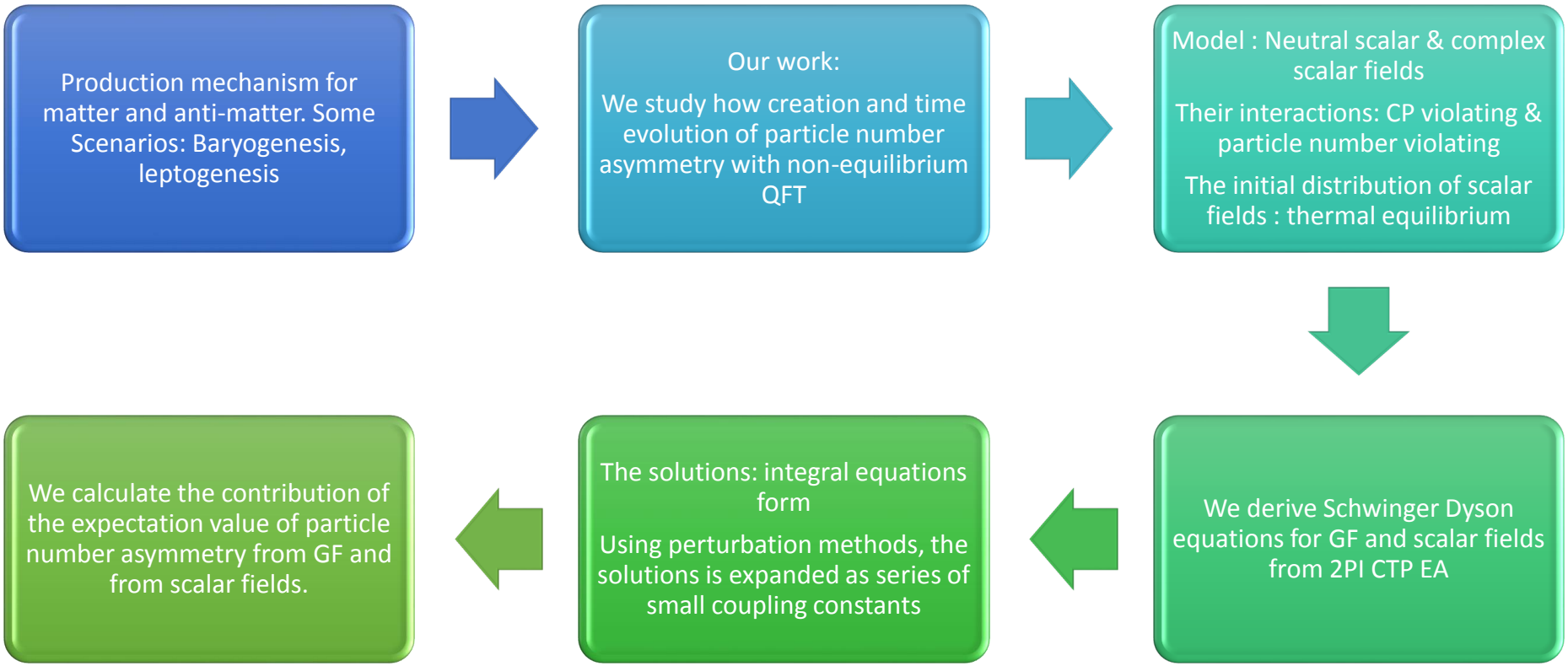
Introduction and Abstract



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

$$\begin{aligned}\left(\frac{a(x^0)}{a_0}\right)^3 \langle j_0(x^0)\rangle \quad = \quad & -\frac{1}{2}\bar{\varphi}^T_{1,\text{free}}(x^0)\tau^1 \overleftrightarrow{\partial}_\mu \bar{\varphi}_{2,\text{free}}(x^0) \\ & +\frac{1}{2}\int \frac{d^3k}{(2\pi)^3}\left(\frac{\partial}{\partial x^0}-\frac{\partial}{\partial y^0}\right)[\hat{G}^{12}_{12,x^0y^0,\text{int}}(\mathbf{k})-\hat{G}^{12}_{21,x^0y^0,\text{int}}(\mathbf{k})]|_{y^0\to x^0} \\ & +\frac{1}{2}[\bar{\varphi}^T_{2,\text{int}}(x^0)\tau^1\dot{\bar{\varphi}}_{1,\text{free}}(x^0)-\bar{\varphi}^T_{1,\text{int}}(x^0)\tau^1\dot{\bar{\varphi}}_{2,\text{free}}(x^0)] \\ & +\frac{1}{2}[\bar{\varphi}^T_{2,\text{free}}(x^0)\tau^1\dot{\bar{\varphi}}_{1,\text{int}}(x^0)-\bar{\varphi}^T_{1,\text{free}}(x^0)\tau^1\dot{\bar{\varphi}}_{2,\text{int}}(x^0)] \end{aligned} \tag{1}$$

$\Rightarrow \bar{\varphi}^T_{1,\text{int}}(x^0)\bar{\varphi}_{1,\text{int}}(x^0)$ 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!