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A Relationship between the Comoving Particle Number and the Effective Cosmological Constant

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In order to discuss and obtain the remaining inflaton potential, we introduced an idea called "effective static friction" in our last paper to balance the "force", $\frac{dV}{d\phi}|_{\phi=\phi(t_{rest})}$, of inflaton. According to this idea, we now discover that, after the course of particle creation, there will be a relationship between the final relativistic particle number inside an arbitrary chosen comoving volume $N_r(t_{rest})$ and the effective cosmological constant Λ in our Universe. This relationship can be expressed as $N_r(t_{rest})=(\frac{\ell^2m_\phi^2\Lambda}{4\pi G\sigma^2(t_{rest})})^{3/2}$ when we employ the classical chaotic model, $V(\phi)=1/2m_{\phi}^2\phi^2$, and consider that ϕ comes to rest at t_{rest}. Moreover, we obtain an evolution equation for the particle number ($N_r(t)$) inside the comoving volume. Meanwhile, a new inflaton field equation which contains parameters of $N_r(t)$ and "particle creation coefficients" can also be found. Importantly, the results illustrate the fact that Λ and N_r are the results of probability.

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