学位論文要旨

Time Reversal Violation through B Meson Mixing

（B 中間子混合を通じた時間反転対称性の破れの研究）

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Time reversal (T) violation is investigated through B physics. We utilize observables in the process of $\Upsilon(4S) \to B\bar{B}$, which are measurable in B factory experiments. Due to Einstein-Podolsky-Rosen entanglement, the correlated information about $B\bar{B}$ is available.

In this thesis, we introduce methodology to gain observables which are sensitive to T violation. The phenomenon of *neutral meson mixing* enables us to test discrete symmetries. The event rates of two processes, $B_- \to \overline{B^0}$ and $\overline{B^0} \to B_-$ (– implies a CP eigenvalue), are utilized. These processes are apparently related with flipping time direction so that the event number difference of the processes seems to be a T violating quantity. However, it turns out that the observable are not exact T violating quantities since a genuine time reversed process is unobserved in the experiments.

We construct time reversal-like asymmetries which consist of the event number difference for the mixing processes of B meson. One can clarify how the asymmetries behave under T transformation to demonstrate that the observable is not precisely a T violating quantity. The overall factors of the time dependent decay rates are taken into account in this thesis. The effect of mixing-induced CP violation in Kaon system is extracted, which yields $O(10^{-3})$ contribution to an observable. Some combinations of the asymmetry enable us to constrain parameters for wrong sign decay of B meson, which is suppressed in the standard model. As a probe of physics beyond the standard model, CPT violation is testable via $B\bar{B}$ mixing observables. The constraints on BSM are obtained through the precise measurement in experiments. Furthermore, we suggest conditions for the asymmetry to be a T-odd quantity. One of such conditions arises due to the difference of overall factors which form the asymmetry.