CPLEAR（時間反転対称性の破れ）

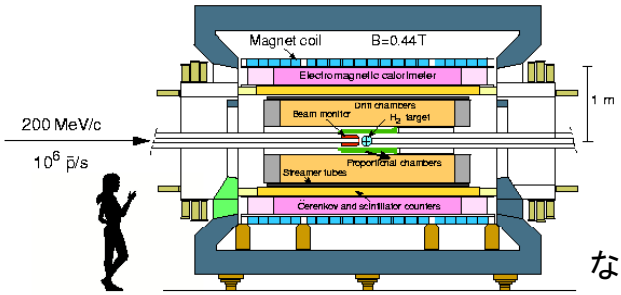
11/30/2007

CP: **C**(Charge:電荷)**P**（parity:パリティ）対称性
LEAR: **L**ow **E**nergy **A**ntiproton **R**ing

- Parity P $\vec{x} \to -\vec{x}$
- Time reversal T $t \to -t$
- Charge conjugation C $q \to -q$

$$A_T = \frac{R[\bar{K}^0(t=0) \to K^0(t=\tau)] - R[K^0(t=0) \to \bar{K}^0(t=\tau)]}{R[\bar{K}^0(t=0) \to K^0(t=\tau)] + R[K^0(t=0) \to \bar{K}^0(t=\tau)]}$$

The CPLEAR Detector



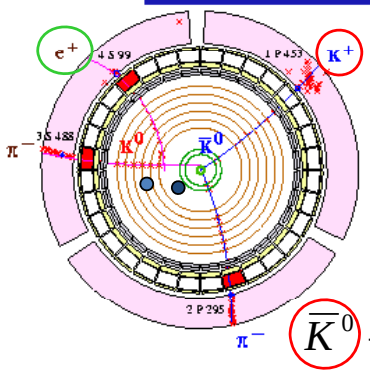
(1) t=0; $p\bar{p} \to K^- \pi^+ K^0$
$\to K^+ \pi^- \bar{K}^0$

ストレンジネス保存

(2)t=t_{decay}; $K^0 \to e^+ \pi^- \nu$
$\bar{K}^0 \to e^- \pi^+ \bar{\nu}$

なぜ$K^0(\bar{s}d)$の崩壊で陽電子e^+がでるか考えてみよう

Analysis of $K^0 \to \pi^\mp e^\pm \nu$

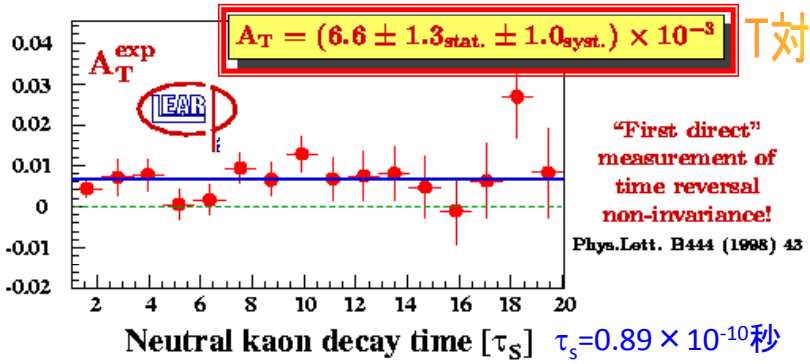


electron identification:

- dE/dx in the scintillators,
- number of photo-electrons in the Čerenkov,
- number of hits in the calorimeter

$\bar{K}^0 \to K^0$

$$A_T = \frac{R(\bar{K}^0 \to e^+\pi^-\nu) - R(K^0 \to e^-\pi^+\bar{\nu})}{R(\bar{K}^0 \to e^+\pi^-\nu) + R(K^0 \to e^-\pi^+\bar{\nu})}$$



T対称性の破れ

"First direct" measurement of time reversal non-invariance!
Phys.Lett. B444 (1998) 43

τ_s=0.89×10^{-10}秒

CPT 保存の下で、Tの破れとCPの破れは同じ。
CPの破れ⇒小林・益川理論 （3世代クォークに関係）