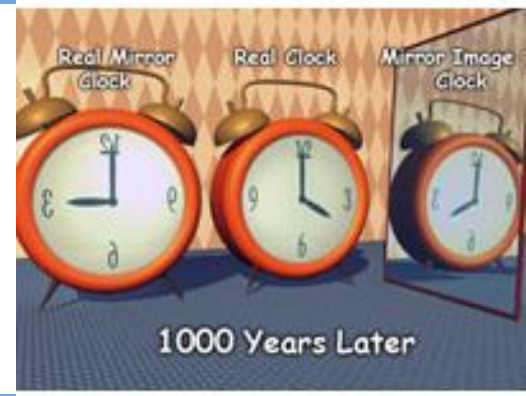


Spontaneous broken symmetry in subatomic physics

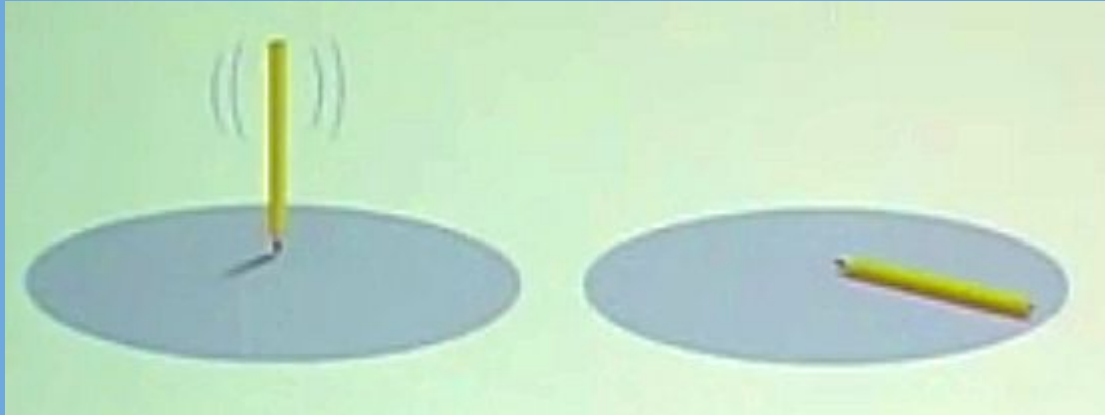
Dyk Chung Nguyen

Outline

- Symmetries and broken symmetries
- Symmetry groups
- Parity violation
- Charge violation
- CP-violation
- Conclusion



Symmetries and broken symmetries



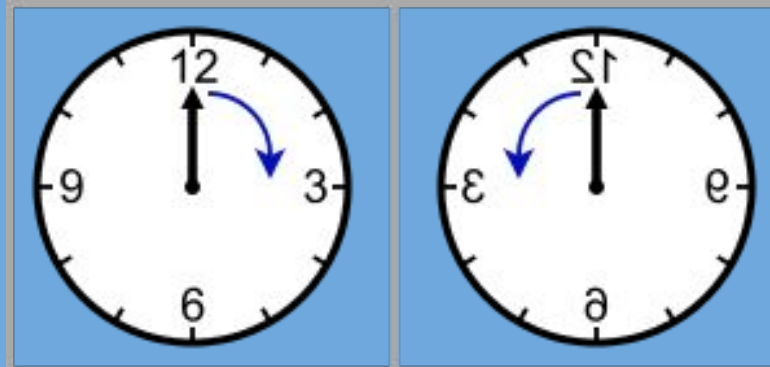
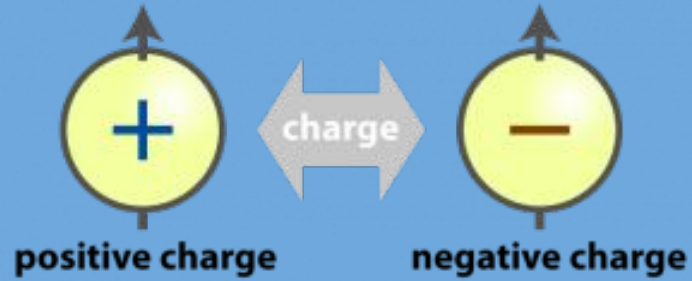
Spontaneous symmetry breaking



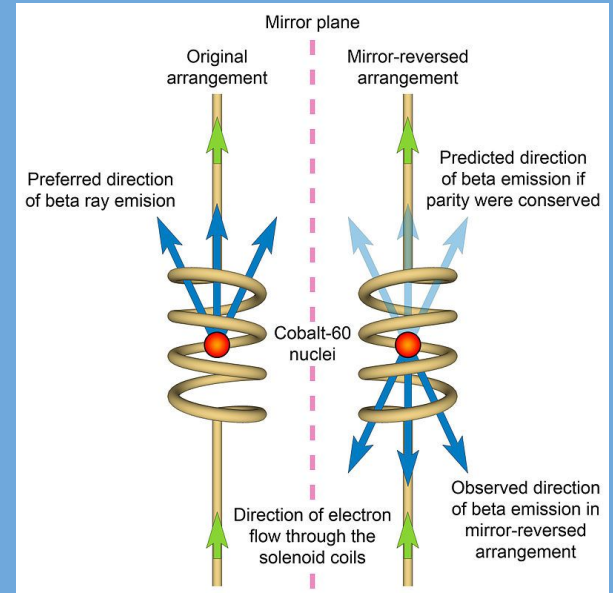
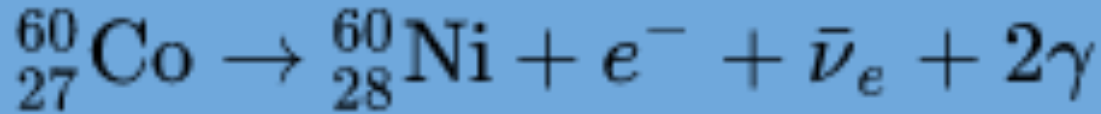
Small explicit symmetry breaking

Symmetry groups

- C-symmetry
- P-symmetry
- T-symmetry



Parity violation in weak interactions



Wu experiment

Charge conjugation violation

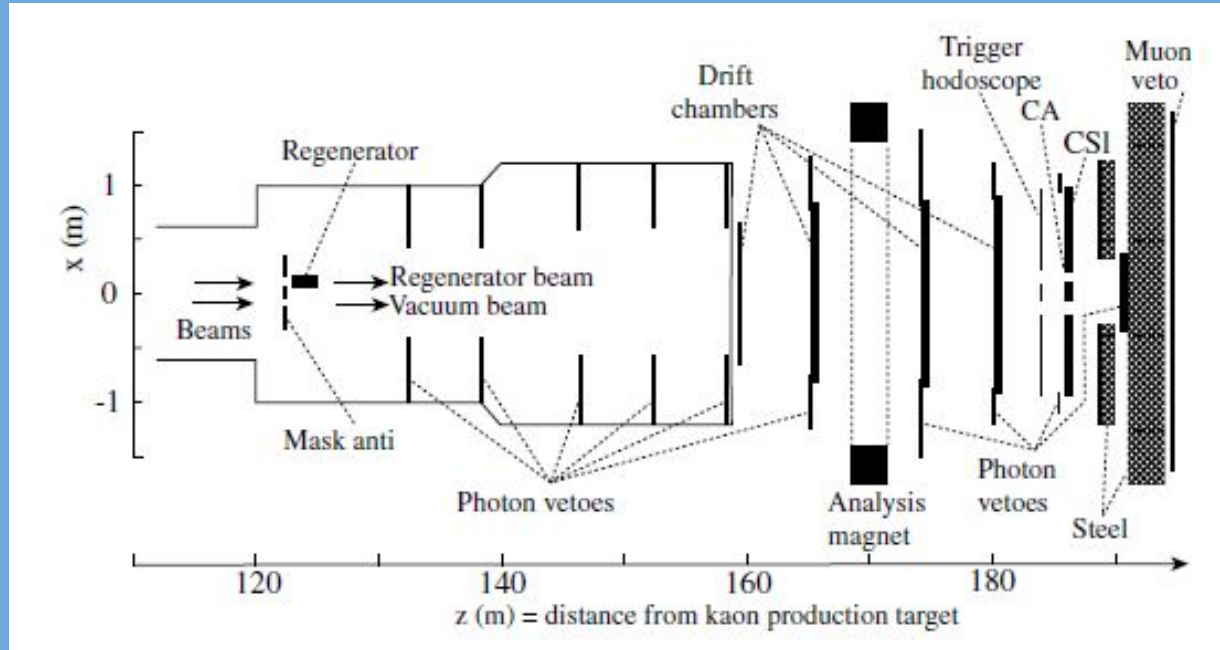
$$\pi^+ \rightarrow \mu^+ + \nu_\mu$$

$$\pi^- \rightarrow \mu^- + \bar{\nu}_\mu$$



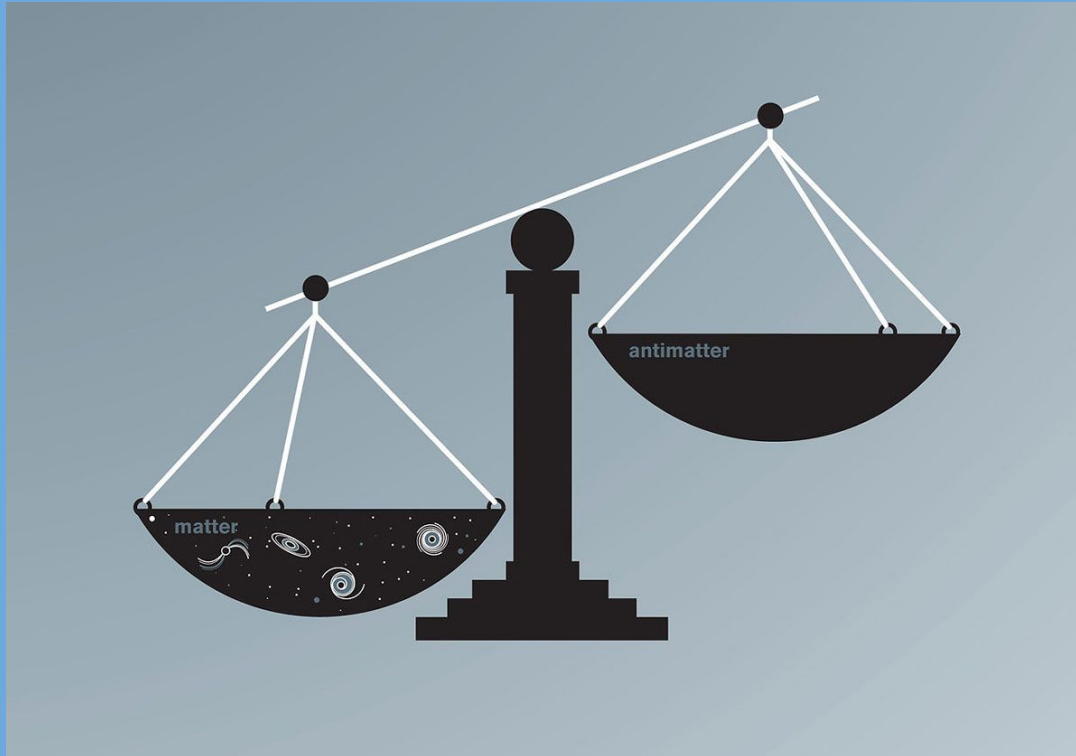
Two particle decays give definite values of energy and momentum to the products.

Direct CP-violation in neutral K decays



Schematic drawing of the KTeV experimental setup (Alavi-Harati et al., 2003)

Matter–antimatter imbalance



References

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Thank you for your attention