About Parity Conservation

Ilgaitis Prūsis[1], Peteris Prūsis[2]

Abstract

According to contemporary physics the conservation law of parity states that parity is conserved in electromagnetism, strong interactions and gravity. In weak interactions the parity can be violated. This article shows that violation of parity conservation in the weak interactions is apparent. In reality, parity is also conserved in weak interactions.

Keywords: physics, mass, parity, interaction, elementary particles, positron, electron, decay, neutrino, Universe, particle physics, Standard Model, barions, photon, parity violation, philosophy, pair generation.

PACS Classification codes:

01.55.+b General physics; 04. General relativity and gravitation; 13.20.-v Leptonic, semileptonic, and radiative decays of mesons; 13.30.-a Decays of baryons; 13.35.-r Decays of leptons; 13.66.Bc Particle production by electron-positron collisions

Introduction

Parity is space inversion [1]. It means that spatial coordinates change the sign to the opposite, i.e., x' = –x, y' = –y and z' = –z. According to the Standard Model the parity is conserved in strong (nuclear) interactions, electromagnetic interactions and gravity. The parity is violated in weak interactions. The general meaning [2] is that the

[1] Independent researcher;
[2] Independent researcher

Wu experiment confirms parity violation. A detailed analysis of the Wu experiment shows that parity violation is apparent.

Wu experiment

The experiment was conducted in 1956 by the Chinese American physicist Chien-Shiung Wu in collaboration with the Low Temperature Group of the US National Bureau of Standards. The purpose of the experiment was to establish whether the conservation of parity could be applied to weak interactions. In the Wu experiment [3] the cobalt-60 atoms decay to nickel-60 (Fig.1.).

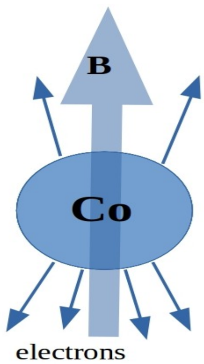

Fig. 1. Wu experiment.
Majority of electrons from cobalt decay was emitted antiparallel to magnetic field B.

Equal numbers of electrons should be emitted parallel and antiparallel to the magnetic field if parity is conserved, but Wu found that more electrons were emitted in the direction opposite to the magnetic field and therefore opposite to the nuclear spin. Therefore Wu concluded that parity in beta decay was not conserved.

According to the Standard Model the decay of cobalt-60 occurs as follows:

$$^{60}_{27}Co \rightarrow {}^{60}_{28}Ni + e^{-} + \bar{\upsilon} ,$$

where: $\bar{\upsilon}$ electron antineutrino.

The complete analysis of the Wu experiment is given below. In the beta decay the hypothesis of electron antineutrino [4] is unnecessary.

Accordingly, within the inside of the nucleus of cobalt-60 a neutron converts to the proton according to the reaction:

$$n \rightarrow n + e^{+} + e^{-} \rightarrow (n + e^{+}) + e^{-} \rightarrow p^{+} + e^{-} .$$

$$\text{Parity:} \quad 1 \rightarrow 1 - 1 + 1 \rightarrow (1 - 1) + 1 \rightarrow 0 + 1 ,$$

where: parity of neutron = 1, parity of positron = –1, parity of electron = 1 and

parity of proton = 1 – 1 = 0.

In this process the parity is conserved. Therefore, the complete process of cobalt-60 decay is: $^{60}{}_{27}Co \rightarrow {}^{60}{}_{27}Co + e^{+} + e^{-} \rightarrow ({}^{60}{}_{27}Co + e^{+}) + e^{-} \rightarrow {}^{60}{}_{28}Ni + e^{-}$

To explain the experimental results Wu did not take into account the electron-positron pair generation inside the nucleus of cobalt-60. The positron was absorbed by the neutron and converted to the proton, but the electron was pushed away in the opposite direction by the recoil momentum.

Conclusions

In beta decay the parity is conserved. Therefore parity is conserved in all interactions. It means that there is another Universe with opposite parity, i.e., an Antiverse [5]. The opposite parity means that the Antiverse contains antimatter, antispace and antitime. Antispace differs from ordinary space with the opposite direction of the coordinate axis. Antitime has an opposite direction of time [6].

References

1. *An Introduction to Particle Physics and the Standard Model.* (2010). *CRC Press.* ISBN 978-1-4200-8298-2

2. Terning J. *Modern Supersymmetry:Dynamics and Duality: Dynamics and Duality*. *New York: Oxford University Press.* (2006). ISBN 0-19-856763-4.

3. Wu, C. S. at all. *Experimental Test of Parity Conservation in Beta Decay. (PDF). (1957) Physical Review.* ***105*** *(4): 1413–1415.* Bibcode:1957PhRv..105.1413W. doi:10.1103/PhysRev.105.1413

4. Prūsis I. and Prūsis P. About Beta Decay.
https://ia601407.us.archive.org/11/items/AboutBetaDecay/About%20Beta%20Decay.pdf

5. Prūsis I. and Prūsis P. Hypothesis of Tetraverse.
https://ia801503.us.archive.org/23/items/HypothesisOfTetraverse/Hypothesis%20of%20Tetraverse.pdf

6. Prūsis I. and Prūsis P. About Arrow of Time.
https://ia601404.us.archive.org/32/items/AboutArrowOfTime/About%20Arrow%20of%20Time.pdf

Acknowledgements: We are very grateful to Ieva Mazere and Valda Kalniņa for valuable discussions and assistance.

Correspondence and requests for materials should be addressed to I.P. (ilgaitis@gmail.com).