Precise measurement of the quark spin by polarized Deep Inelastic Scattering in HERMES Experiment

Takuto Miyazaki 14M01212 Shibata lab. May 16th, 2014

Prediction from the quark model

- In the quark model, the nucleon spin is the sum of the spins of the three quarks

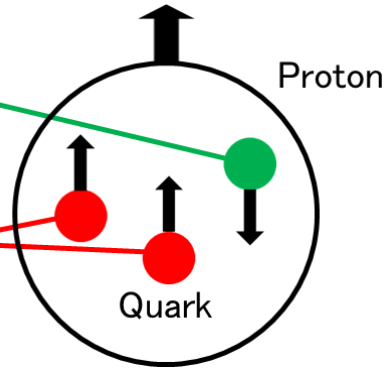
The nucleon spin is the sum of
two quark with spin parallel to the proton spin and one quark with spin antiparallel to the proton spin

The proton spin is expressed...

$$\frac{1}{2} = \boxed{\frac{1}{2} + \frac{1}{2}} + \boxed{\left(-\frac{1}{2}\right)}$$

The quark with spin antiparallel to the proton spin

The quark with spin parallel to the proton spin



However

The EMC Experiment shows the contribution of the quark spin to the nucleon spin is very small

How much is the contribution of the quark spin to the nucleon spin?

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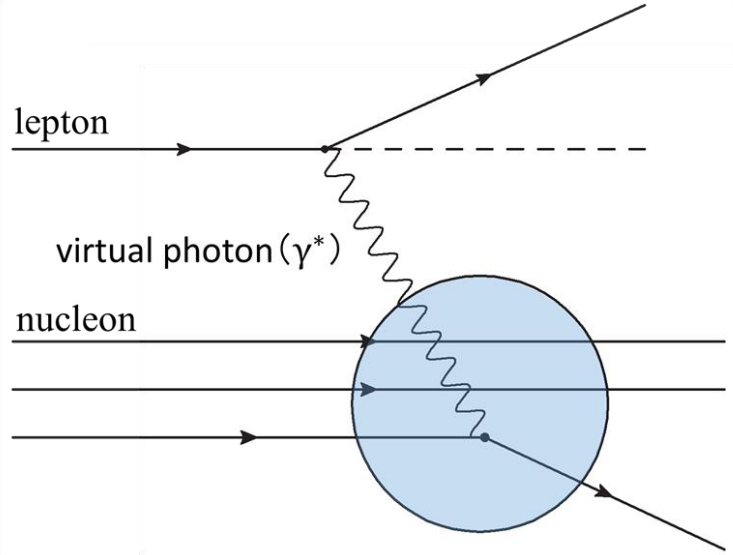
HERMES measured the contribution of the quark spin to the nucleon spin by Deep Inelastic Scattering

Deep Inelastic Scattering (DIS)

- Lepton scattering exchanging a virtual photon with a target nucleon
- Effective method to investigate the internal structure of the nucleon



HERMES is a DIS Experiment

- The purpose is to study the spin structure of the nucleon
- Polarized DIS Experiment using a polarized electron beam and a polarized gas target
- Cross section and structure function were precisely measured

➡ The contribution of the quark spin to the nucleon spin is approximately 33%

In the poster, I will show how to study the quark spin through cross section and structure function