# Direct measurement of $\Delta\bar{u}/\Delta\bar{d}$ using Drell–Yan processes on meson–nucleon collisions

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In 1991 the NM Collaboration (NMC) at CERN has reported on the violation of the Gottfried sum rule (GSR) from measurements of the unpolarized structure functions of the proton and the neutron[1]. This issue implied a significant flavor asymmetry for the unpolarized light–sea quark distributions, namely $\bar{u}(x) \neq \bar{d}(x)$, furthermore this asymmetry was independently confirmed by other experiments.

This arises a question whether the longitudinally polarized light-sea quark distributions have this asymmetry, which have been assumed to be symmetric in data analyses. Recently, it was pointed out[2] that $\Delta\bar{u}(x)$ and $\Delta\bar{d}(x)$ is asymmetric from the analysis of the experimental data for the longitudinally polarized semi–inclusive DIS[3,4]. However, this result has ambiguities because of the fragmentation functions and statistical error of data. At present, we cannot derive conclusive statement on $\Delta\bar{u}(x)$ and $\Delta\bar{d}(x)$ from experimental data.

Here we propose a new way to directly and cleanly probe $\Delta\bar{u}(x)/\Delta\bar{d}(x)$ from Drell–Yan processes with longitudinally polarized nucleon targets and charged $K$ meson beams by measuring the helicity of one of produced pair leptons. By choosing special kinematic regions, we find that the spin–dependent differential cross sections for the proton and neutron targets are dominated by terms proportional to $\Delta\bar{u}^p(x_2) \cdot u^{K^+}(x_1)$ and $\Delta\bar{d}^p(x_2) \cdot u^{K^+}(x_1)$, respectively. Therefore, the ratio of the spin–dependent differential cross sections of the proton and neutron targets is described as

$$\frac{d\Delta\sigma^{nK^+}}{d\Delta\sigma^{pK^+}} = \frac{\Delta\bar{d}^p(x_2)}{\Delta\bar{u}^p(x_2)} \; .$$

At present, Japan Hadron Facility (JHF) is under construction in Japan. It provides the experiment with a 50 GeV high intensity proton beam and also can produce high intensity pi/K meson beams. We give quantitative estimation for the spin–dependent differential cross sections for our processes at the JHF energy and discuss the possibility of the JHF experiments.

## References

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