論文の内容の要旨

論文題目：Measurement of Charms and Bottoms with Semi-leptonic Decay Modes in p+p Collisions at $\sqrt{s}$ = 200 GeV

（重心エネルギー２００GeVの陽子衝突における、セミレプトニック崩壊モードを用いたチャームとボトムの測定）

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A heavy quark is an interesting probe to understand a parton behavior in the extremely hot and dense matter created by the relativistic heavy-ion collision. The heavy quarks are only produced in initial parton scattering in nucleus+nucleus~(A+A) collisions due to their large masses. It means that the properties of the heavy quarks at the initial stage of the heavy-ion collisions can be described by those of p+p collisions, and thus, the difference of the final states of the heavy quarks between the heavy-ion collisions and p+p collisions represents modifications during passing through the matter. The signal from the heavy quarks in A+A collisions has been measured via the measurement of the electrons from heavy quark decays~(heavy quark electrons).
A strong suppression at high transverse momentum (p_T) comparing to the result in p+p collisions and a large azimuthal anisotropy have been observed in the spectrum of the heavy quark electrons. Since a large fraction of the heavy quark electrons is the decay from charm, the result can not explain without the fact that charm loses a large fraction of its energy and flows in the matter. However, the contribution of bottom is not understood.

A new approach called DCA approach has been developed to evaluate the fraction of the bottom contribution in the heavy quark electrons. The distribution of the distances of the closest approach to the beam collision vertex, called DCA, is utilized in the DCA approach. The distributions of the electrons from charm and bottom decays have significantly different widths due to the differences of life-time and q-value between charm and bottom. The fraction has already evaluated in p+p collisions by other approaches which use correlations between the electrons and hadrons from charm and bottom decays. However, these approaches can not be utilized for the evaluation in A+A collisions due to a large combinatorial background. The DCA approach is an alternative for them to overcome the problem and achieve the evaluation in the fraction in A+A collision.

The bottom fraction has been evaluated by the DCA approach in p+p collisions with $\sqrt{s}$=200GeV at 1.5 < p_T < 5 GeV/c and |y| < 0.35. The result is consistent with the results evaluated by other approaches, and thus it is confirmed that the evaluation by the DCA approach has been succeeded. The result provides the bottom fraction at 1.5 < p_T < 2.5 GeV/c for the first time, where a large azimuthal anisotropy of the heavy quark electrons has been observed at the region. The total cross section of the bottom production is also determined to 3.41±0.53(stat)±2.14(sys) μb.