博士論文公聴会の公示（物理学専攻）

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論文題目：Microscopic reaction dynamics for the study of heavy baryon structure
(微視的反応ダイナミックスによるヘビーバリオン構造の研究)

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(部屋の換気等、新型コロナウイルス感染症拡大防止に留意しつつ、対面形式にて行います。ご来聴の方はマスクの着用をお願い致します。)

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論文要旨：

In recent years much interest in hadron physics is payed to new heavy hadrons. Properties of many of them containing charm and bottom quarks are not yet understood well, including exotic states that cannot be explained by a naive quark model with two or three valance quarks. Therefore, in order to better understand the properties of these hadrons, further theoretical and experimental studies are necessary. In such a situation, hadrons which contain both heavy and light quarks provide a very good laboratory.

In the present thesis, a new microscopic mechanism for heavy baryon production reaction $\pi^- + p \rightarrow M + Y$ is proposed, where M is a strange or charmed meson and Y is a strange or charmed baryon. In fact, an experiment is planned at J-PARC (E50) to measure the productions of charmed baryons by using the high momentum pion beam. Since it is possible also to produce strange baryons, we study both strangeness and charm baryon productions. In performing such reaction experiments, we expect that various heavy baryons are produced. In this thesis, we examine how the baryon structure plays a role in the productions of heavy baryons.

The main content of the present thesis is to formulate a microscopic process which is called two-quark process. It is a reaction in which two quarks in the baryons are involved in the production process. This is a new mechanism in addition to the one-quark process which was studied previously. In contrast to the one-quark process where only the lambda mode is excited, the two-quark process can produce baryons with both the rho and lambda mode excitations. These modes are the two basic excitation modes of a three-quark system. Moreover, the two-quark process enables to share the large momentum transfer that is needed in the heavy baryon productions, and hence, is expected to dominate in heavier baryon productions over the one-quark process.

The formulated two-quark processes are numerically computed, and are investigated in detail to study the above points; the relation between the reaction rates and the structures of various baryons, and the effect of the sharing of the large momentum transfer by two quarks, in comparison with the previous one-quark process. We have clarified the important features of the two-quark processes and made predictions that can be tested in the future experiments.