

Charmed baryons and their interactions

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Charmed baryons are expected to provide a unique opportunity for the study of heavy and light quark systems for hadrons. Due to different masses of quarks, new aspects of excitation modes will appear for light and heavy quarks, which are not seen in the light flavor systems of equal quark mass. To observe and identify such new modes, J-PARC experiments are planned by using a high momentum pion beam. A systematic investigation with different flavors including strange quarks is also important. Thus not only charmed baryons but also hyperons and their excitations are also interesting objects to be studied.

In this presentation, we first briefly discuss the unique feature of the heavy and light quark systems in their excited states. The distinction of the ρ and λ internal modes of three-body system will be emphasized [1]. Then we estimate the production rate of charmed baryons by using reaction models of Regge theory, and by quark model wave functions for excited states [2]. We expect abundant production rate for certain excited states which makes good opportunity for the study of charmed baryons. Finally, we study the decays of excited states. There are two decay modes which are qualitatively different available, one is the pion emission with a heavy baryon ground state and the other a heavy meson emission with a nucleon ground state. We discuss in detail the pion emission process where the soft pion process is applied and suitable for the study of the structure.

References

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