Spectroscopy of heavy flavor baryons at J-PARC

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Hadrons are composite particles of interacting quarks and gluons. In recent years, quantum chromodynamics (QCD) has successfully described the interaction of quarks and gluons. However, the dynamics of low-energy QCD, such as hadron formation, has not been clearly explained because perturbation theory does not work in the low-energy regime. Elucidation of hadron formation is one of the fundamental goals of hadron physics. Recent experimental results have revealed rich properties of hadronic excited states. To understand these properties, it is necessary to investigate the effective degrees of freedom of hadrons beyond the ordinary constructive quark model. Diquark correlation and hadronic molecule can be new effective degrees of freedom for describing hadronic structures. Spectroscopic observations of charmed and strange baryons (Λ_c/Σ_c, Ξ, Ω) can provide a unique opportunity to study diquark correlation. Systematic studies of charmed and strange baryons are expected to reveal new effective degrees of freedom for describing hadron structures.

The Hadron Experimental Facility at J-PARC aims at revealing hadron structures using the world's most intense meson beam. J-PARC high-momentum beam line called the π20 beam line is under construction, and a charm baryon spectroscopy experiment (J-PARC E50) is planned. In the future, the Hadron Experimental Facility will be extended for constructing new beam lines with special capabilities. A dedicated high-momentum beam line called the K10 beam line, which can provide separated negative kaon beam up to 10 GeV/c, is planned. Hadron beams are an essential tool for studying the excited states of charmed and strange baryons. J-PARC promotes important research in hadron physics.