Contribution ID: **125**

Type: **Invited talk**

Spectroscopic Study of Quark Dynamics in Baryons at J-PARC

Wednesday 1 December 2021 11:50 (30 minutes)

Hadrons are complex systems of quarks (and gluons) first formed and followed by matter evolution in the universe. The strong interaction plays an important role in formation of matter. The quantum chromodynamics (QCD), which is the fundamental theory of the strong interaction, shows highly non-perturbative behaviors in low energy and thus is difficult to solve. A fundamental question, how hadrons are built from quarks, has not yet been answered clearly.

The most important behavior in low energy QCD is a spontaneous breaking of chiral symmetry caused by non-trivial QCD vacuum. As a result, constituent quarks with earning a finite mass due to chiral condensate emerge. At the same time, Nambu-Goldstone bosons, such as pions, are generated. Features of hadrons, are thus to be described by the dynamics of constituent quarks. Confinement force, one-gluon-exchange, and instanton-induced interactions are often employed as effective interactions between constituent quarks. By these, the level structure depending on internal motions and spins of quarks in hadrons are characterized. Production cross sections and/or decay total/partial width (decay branching ratios) are also responding to internal structure of hadrons.

Systematic studies of excited baryons with heavier flavors such as strange and charm quarks provides good opportunities to investigate the dynamics of the constituent quarks as internal quark motions can be disentangled by introducing different flavors in baryons. Quark-quark (diquark) correlations appearing in excited stated are of particular interest. They are related to the spin-dependent interactions originated in the non-trivial QCD vacuum.

At the J-PARC Hadron Experimental Facility, we will be able to study excited singly-charmed (Λ_c/Σ_c) and doubly/triply-strange (Ξ/Ω) baryons by utilizing intense pion and kaon beams up to 20 GeV/c. By means of missing mass techniques, we will measure those baryons up to highly excited states inclusively. Through systematic measurements of their masses, spin-parities, production rates, and decay branching ratios, we will reveal the diquark correlations and the origin of the spin-dependent interaction behind them.

Author: NOUMI, Hiroyuki (Osaka University)

Presenter: NOUMI, Hiroyuki (Osaka University)

Session Classification: Plenary Session