

XVth Quark Confinement and the Hadron Spectrum



Contribution ID: 332

Type: Oral

Experimental studies of baryon modification in nuclei using hyperons

Thursday 22 August 2024 12:00 (30 minutes)

Since the EMC effect indicates modification of quark distribution in the nucleons inside the nucleus, the properties and structure of nucleons might be modified in the nucleus. However, it is still unclear. In order to correctly describe high-density nuclear matter in neutron stars, this problem should be also studied, as well as the nuclear force in dense nuclear matter.

We are planning to experimentally investigate possible modification of baryons in nuclei by using hyperons in hypernuclei. The J-PARC E63 experiment will investigate possible change of the magnetic moment of the Λ hyperon in hypernuclei by measuring the $B(M1)$ value of the Λ 's spin-flip $7\Lambda\text{Li}(3/2^+ \rightarrow 1/2^+)$ transition. Another experiment will study possible change of the Λ 's beta-decay rate in hypernuclei. The Quark Meson Coupling model predicts a reduction of the beta-decay rate up to 20% by baryon modification. We are considering an experiment at J-PARC to measure the beta-decay rate precisely via the beta-decay branching ratio and the lifetime of the Λ in hypernuclei such as $5\Lambda\text{He}$ and $13\Lambda\text{C}$. We are currently designing the detectors, but precise estimates of various nuclear effects in the Λ 's beta decay are essential, and we strongly need the advice and cooperation by theorists.

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Session Classification: Nuclear and Astro-particle Physics

Track Classification: F: Nuclear and Astro-Particle Physics