Contribution ID: **20** Type: **not specified**

Electromagnetic and axial structure of baryons in dense nuclear matter

Wednesday, April 2, 2025 5:00 PM (25 minutes)

We study the electromagnetic and axial structure of the octet baryons in a nuclear medium in terms of the nuclear matter density ρ. The experimental information about the internal structure of baryons in nuclear medium is very scarce. Theoretical studies are then fundamental for the understanding of environments with dense nuclear matter, from the high energy nucleus-nucleus collisions to the cores of compact stars. The electromagnetic and axial form factors of the octet baryons are determined by combining a covariant quark model, developed for free space, with the quark-meson coupling model in the extension to the nuclear medium. We conclude that, the nuclear medium modifies the baryon properties differently (quenched or enhanced) according to the flavor content of the baryons. In general, the effects of the nuclear medium are stronger for lighter baryons than for heavier baryons. The numerical values for the electromagnetic and axial form factors are used to calculate the neutrino-nucleon and antineutrino-nucleon cross sections for bound nucleons. We also discuss the extension of the model for nuclear densities above the normal nuclear matter $\rho_0 = 0.15\,\mathrm{fm}^{-3}$ up to $\rho = 3\rho_0$.

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Session Classification: Parallel Session (A)