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Electroweak pion production off nucleons near threshold in ChPT

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We study the CC and NC electroweak pion production off nucleons in a fully relativistic ChPT with explicit contributions of the Δ resonance at energies close to the threshold.

At low energies, the experimental data is scarce for weak pion-production processes and theoretical models should be fairly predictive. In order to do this some of the most relevant parameters in the amplitude, still unknown for the weak production process, were recently fitted with pion photo- and electroproduction data (>2800 data points) using the same relativistic ChPT+ Δ approach. This work is able to reproduce very well the electromagnetic pion-production data with few parameters up to 70 MeV above the threshold and gives support to the chiral calculations of the neutrino induced pion production and allow for more precise predictions of the cross-sections.

We found that Δ contribution is still crucial to reproduce the data close to the threshold for the photo- and electroproduction processes and the current calculation of the neutrino pion-production shows similar results at several energies.

This study represents joint efforts at the neutrino-nucleon level and new achievement in the precision goals of future neutrino experiments establishing a strong base for further studies involving neutrino-nucleus processes.

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