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Meson-baryon Scattering in Extended-on-mass-shell Scheme at O(p3)

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The scattering processes of particles have always been one of the focus of attention. Since the fundamental theory for strong interaction, quantum chromodynamics (QCD), was proposed, people are always very curious and enthusiastic to figure out how particles interact, or in another word, scatter with each other in all energy sector. However, as is known to us all, one critical feature of QCD is its asymptotic freedom, that is, the coupling constant increases extremely fast in the wake of the decreasing of transfer momentum. This means that in the low energy sector, one cannot apply a perturbation theory to treat the scattering processes. To deal with these problem, effective field theory (EFT) is introduced as a substitute of QCD in low energy sector. Taking hadrons, i.e. pions, kaons, eta-mesons, and baryons as the degrees of freedom rather than quarks and gluons, the EFT is formulated in terms of the most general Lagrangian consistent with chiral symmetry as well as the other continuous and discrete symmetries. The corresponding field theoretical formalism is called chiral perturbation theory (ChPT). Organized according to certain power counting rules and absorbing the divergence and other contribution into low energy constants (LECs), the ChPT allows a systematic method to improve the description about the target process. This makes the ChPT extremely advantageous.
The application of ChPT on meson scattering processes turned out to be a huge success. However, since the masses of baryons at chiral limit do not vanish, the powering counting rules for baryons make the Baryon chiral perturbation theory (BChPT) a tough problem. People first proposed a non-relativistic scheme assuming infinite baryon masses, which is now called heavy baryon(HB) ChPT. Soon afterwards, a relativistic scheme called infrared (IR) method was proposed. But the analytic properties are somehow broken. The third one is the so-called Extend-on-mass- shell(EOMS) scheme. In the last few years, the EOMS scheme has been applied to solve many problems such as baryon magnet, baryon sigma terms and so on. Compared to the former two schemes, EOMS scheme seems to converge faster and has fewer LECs at certain order.
In the meson baryon scattering, the EOMS scheme seems to be rather popular. In SU(2) cases, pi-N scattering was calculated up to O(p4) by Deliang Yao et.al. In this work, we try to extend the calculation to SU(3) up to O(pˆ3). Combining the recent scattering data of Kaons and nucleons, we try to fit the LECs in the theory. We investigated the convergence and try to include the contribution from $\Delta(1232)$ and resonances like $\Lambda(1405)$.

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