

Theory and computation highlights in November, 2019
(*Contribution to the Director's Monthly Report to JSABOD*)
December 11, 2019

JPAC has been collaborating with CLAS experimentalists on interpretation of their data on their measurement of the exclusive reaction $\gamma + p \rightarrow a_2(1320) + p$ with a_2 decaying to $\eta\text{-}\pi$ pairs. This is the first time the neutral a_2 cross section has been measured in diffractive photoproduction. By investigating energy and momentum transfer dependence of the measured cross section we have established that the a_2 production follows from expectations of Regge theory, in particular the dominance of the natural parity, vector exchanges, which lead to a characteristic dip in the cross section at $-t \sim 0.5 \text{ GeV}^2$. Understanding mechanisms of $\eta\text{-}\pi$ production is crucial for spectroscopy, especially when disentangling new, e.g. exotic hybrid, resonance signals from non-resonance backgrounds. A CLAS paper with JPAC theory co-authors is in final stages of a review process by the collaboration.

Vector currents, being intimately related to the flavor SU(3) symmetry of QCD, representing a fundamental probe for hadron structure as well as for the breaking of SU(3) by quark masses. Theory Center joint staff, Dr. Goity and his postdoc completed a new paper [arXiv:1911.00987] to apply the Baryon Chiral Perturbation Theory (BChPT) combined with the $1/N_c$ expansion to the SU(3) vector currents. In terms of the ξ power counting linking the low energy and $1/N_c$ expansions according to $O(\xi) = O(p) = O(1/N_c)$, the study was carried out to next-to-next-to-leading order, and it includes SU(3) breaking corrections to the $|\Delta S| = 1$ vector charges, charge radii, and magnetic moments and radii. The results were obtained for generic N_c , allowing for investigating the various scalings in N_c .