The Pomeron-$p\overline{p}$ Form Factor and Observables of Non $q\overline{q}$ Mesons

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The connection between QCD and Regge theory has been a major interest of theorists for many years. It is well known that the Regge theory was very successful in describing certain aspects of the strong interaction before the advent of QCD. In recent years, there are many promising works on the QCD interpretation of the Pomeron($\mathcal{P}$). However, in physical processes involving small momentum transfers, the Pomeron-nucleon coupling is of nonperturbative nature. In the literature, the extensively used model for the quark-Pomeron-exchange vertex is the γ^μ model[1]. However, this vertex is not even under charge conjugation, thus, it violates the property of the Pomeron. Using general *covariance considerations* and the properties of the Pomeron, I have obtained a covariant $\mathcal{P}q\overline{q}$ vertex function which is even with respect to charge conjugation. From this $\mathcal{P}q\overline{q}$ vertex, a $\mathcal{P}p\overline{p}$ vertex is then obtained, which preserves the correct charge-conjugation property of the Pomeron. I will also show a form factor that is analytic in both the direct s-channel and the crossed t-channel. This latter form factor allows an analytic continuation of the Pomeron vertex function between the time-like and space-like regions. The general feature of the vertex function can be verified by any specific model. This will be shown with a quark-current model[2].

The coupling constant and the range parameters of the form factor can be determined from the high-energy pp scattering data. Once they are determined, the Pomeron-exchange model can give a prediction on the observables of various isoscalar tensor mesons which might situate on the Pomeron trajectory. I will show how Regge theory can be used to predicted total decay widths and the two-body decay branching ratios of these mesons[3,4]. A comparison with the already measured observables indicates that the predictions are in good agreement with the data, giving us the confidence in the predictions for the not yet measured ones. There is a strong interest in knowing if the postulated Pomeron is a reality or just a convenient mathematical device. So far, the Pomeron remains elusive. However, there are many new mesons that cannot be classified as $q\overline{q}$ mesons and cannot be put onto Regge trajectories that are distinct from the Pomeron[5]. The predicted observables of the non $q\overline{q}$ mesons can serve as a guide in the hunt for the Pomeron.

References

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