Pion and kaon vector form factors and some applications

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Abstract

We develop a unitarity approach to consider the final state interaction corrections to the tree level graphs calculated from Chiral Perturbation Theory (χPT) allowing the inclusion of explicit resonance fields. The method is discussed considering the coupled channel pion and kaon vector form factors. These form factors are then matched with the one loop χPT results. A very good description of experimental data is accomplished for the vector form factors up to $\sqrt{s} \leq 1.2$ GeV beyond which multiparticle states play a non negligible role. For the P-wave $\pi\pi$ phase shifts the agreement with data stands even higher up to $\sqrt{s} \leq 1.5$ GeV. We also consider the isospin breaking effects due to the $\omega - \rho$ mixing as a perturbation to the previous results. Then we apply our pion and kaon vector form factors to calculate the decay widths of $\tau^{\rightarrow}\pi^- + \pi^0 + \nu_{tau}$ and $\tau \rightarrow K^- + K^0 + \nu_\tau$ and the contribution to the anomalous magnetic moment of the muon of these mesons.