Pion and kaon vector form factors and some applications

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We develop a unitarity approach for 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 to fix the free parameters of the approach. A very good description of experimental data is accomplished for the vector form factors and for the $\pi\pi$ P-wave phase shifts up to $\sqrt{s} \leq 1.2$ GeV, beyond which multiparticle states play a non negligible role. In particular the low and resonance energy regions are discussed in detail and for the former a comparison with one and two loop χPT is made showing a remarkable coincidence with the two loop χPT results. This form factors are then applied to calculate the contribution of pions and kaons to some observables such as the τ decay to such mesons, the anomalous magnetic moment of the muon, the running of the effective coupling constant of QED and the muonium hyperfine structure. A detailed description of the approach followed to describe the form factors and their applications can be found in references [1,2].

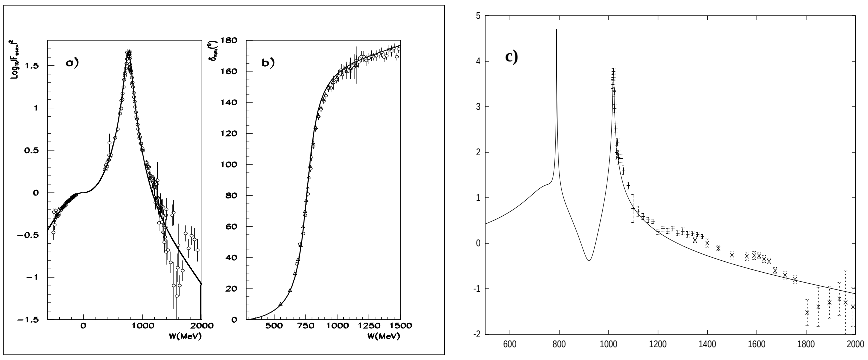

Figure 1: a) Pion vector form factor. b) $\pi\pi$ phase shifts. c) Kaon form factor.

References

[1] J. A. Oller, E. Oset and J. E. Palomar, Phys. Rev. D **63**, 114009 (2001).
[2] J. E. Palomar, arXiv:hep-ph/0202203.