LEADING LOGARITHMS FOR MESONS AND THE HADRONIC LIGHT-BY-LIGHT CONTRIBUTION TO THE MUON ANOMALOUS MAGNETIC MOMENT

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I will discuss two topics which are under active investigation in Lund at the moment. The first concerns some recent work on the calculation of leading logarithms to high orders in mesonic effective field theories. I will discuss why it is possible to calculate leading logarithms in chiral perturbation theory and related theories in an easier fashion than the full higher loop results. I will show the principle and the older results on masses and decay constants [1,2]. We have recently extended this analysis to the anomalous sector [3] where we obtained results for the anomalous processes $\pi^0 \to \gamma\gamma$ and $\gamma\pi \to \pi\pi$. The structure of the leading logarithm corrections to $\pi^0\gamma\gamma$ shows that a factorizable ansatz for the double off-shell case might be a reasonable approximation. The results indicate that for the anomalous processes the higher order chiral logarithms in the two-flavour case are small.

I will present first preliminary results also for the case of N quark flavours for the leading logarithms as well [4]. The published work has been for the two-flavour case only where the structure of the Lagrangian is simpler.

A second topic is the hadronic light-by-light contribution to the muon anomalous magnetic moment. I will describe some of the work ongoing in this respect. Here we concentrate on studying the regions where important contributions arise. This work was started for the dominant pion exchange contribution in [5]. Here I will present some preliminary results on the quark loop contribution as well as a deeper study of the pion loop contribution. In particular I will show why the two main existing results, the full VMD model and the hidden local symmetry one have such a different result [6]. I will also discuss how the recent observation of [7] can be looked at from this perspective.

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