



Identifiant de la contribution : 49

Type : 15+5

Determining the photon polarization of the $b \rightarrow s$ gamma using the $B \rightarrow K_1(1270) \gamma \rightarrow (K \pi \pi) \gamma$ decay

jeudi 13 janvier 2011 11:40 (15)

Recently the radiative B decay to the strange axial-vector mesons, $B \rightarrow K_1(1270)\gamma$, has been observed with rather large branching ratio. This process is particularly interesting as the subsequent K_1 decay into its three body final state allows us to determine the polarization of the photon, which is mostly left- (right-)handed for $\bar{B}(B)$ in the SM while various new physics models predict additional right- (left-)handed components. A new method is proposed to determine the polarization, exploiting the full Dalitz plot distribution, which seems to reduce significantly the statistical errors.

This polarization measurement requires however a detailed knowledge of the $K_1 \rightarrow K\pi\pi$ strong interaction decays, namely, the various partial wave amplitudes into the several possible quasi two-body channels, as well as their relative phases.

The pattern of partial waves is especially complex for the $K_1(1270)$. We attempt to obtain the information through the combination of an experimental input and a theoretical one, provided by the 3P_0 quark-pair-creation model.

Summary

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Thématiques affectées : Main