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

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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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