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Potential of a combined analysis of the $\tau^- \rightarrow (K\pi)^- \nu_\tau$ and $\tau^- \rightarrow K^- \eta \nu_\tau$ decays

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We illustrate how the $K^*(1410)$ resonance parameters can be extracted with improved precision by exploiting the synergy of a combined study of the $\tau^- \rightarrow (K\pi)^- \nu_\tau$ and $\tau^- \rightarrow K^- \eta \nu_\tau$ decays for the first time. On the one hand we take advantage of the much larger statistics accumulated for the former decay in the $K_S \pi^-$ channel, while on the other we also benefit from the larger sensitivity of the latter decay to the properties of this resonance.

Our study is done in the frame of Chiral Perturbation Theory including resonances as explicit degrees of freedom. Different resummations of final state interactions are considered, allowing for a better control of the theoretical uncertainties.

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