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Title:	Dalitz analysis of $D^0 \rightarrow K^- \pi^+ \eta$ decays at Belle
Authors:	Bhardwaj, V. (/jspui/browse?type=author&value=Bhardwaj%2C+V.)
Keywords:	Branching fraction Hadronic decays Dalitz analysis
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Abstract:	We present the results of the first Dalitz plot analysis of the decay $D^0 \rightarrow K^- \pi^+ \eta$. The analysis is performed on a data set corresponding to an integrated luminosity of 953 fb ⁻¹ collected by the Belle detector at the asymmetric-energy e ⁺ e ⁻ KEKB collider. The Dalitz plot is well described by a combination of the six resonant decay channels $K^*(892)^0 \eta$, $K^*(1410)^0 \eta$, $K^*(1680)^- \pi^+$ and $K_2^*(1980)^- \pi^+$, together with $K\pi$ and $K\eta$ S-wave components. The decays $K^*(1680)^- \rightarrow K^- \eta$ and $K_2^*(1980)^- \rightarrow K^- \eta$ are observed for the first time. We measure ratio of the branching fractions, $B(D^0 \rightarrow K^- \pi^+ \eta) B(D^0 \rightarrow K^- \pi^+) = 0.500 \pm 0.002(\text{stat}) \pm 0.020(\text{syst}) \pm 0.003(\text{BPDG})$. Using the Dalitz fit result, the ratio $B(K^*(1680)^- \rightarrow K^- \eta) B(K^*(1680)^- \rightarrow K^- \pi^+)$ is measured to be $0.11 \pm 0.02(\text{stat}) - 0.04 \pm 0.06(\text{syst}) \pm 0.04(\text{BPDG})$; this is much lower than the theoretical expectations (≈ 1) made under the assumption that $K^*(1680)$ is a pure 13D1 state. The product branching fraction $B(D^0 \rightarrow [K_2^*(1980)^- \rightarrow K^- \eta] \pi^+) = (2.2 - 1.9 + 1.7) \times 10^{-4}$ is determined. In addition, the $\pi\eta'$ contribution to the $a_0(980)$ resonance shape is confirmed with 10.1σ statistical significance using the three-channel Flatté model. We also measure $B(D^0 \rightarrow K^*(892)^0 \eta) = (1.41 - 0.12 + 0.13)\%$. This is consistent with, and more precise than, the current world average $(1.02 \pm 0.30)\%$, deviates with a significance of more than 3σ from the theoretical predictions of $(0.51 - 0.92)\%$.
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