

Study of K^0_S pair production and $\eta_c(1S)$, $\eta_c(2S)$ and non-resonant $\eta' \pi^+ \pi^-$ in two-photon collisions at Belle

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We report the measurements of $\gamma\gamma \rightarrow \eta_c(1S)$, $\eta_c(2S) \rightarrow \eta' \pi^+ \pi^-$ with η' decay to $\gamma\rho$ and $\eta \pi^+ \pi^-$. First observation of $\eta_c(2S) \rightarrow \eta' \pi^+ \pi^-$ with a significance 5.5σ including systematic error is obtained. The products of the two-photon decay width and branching fraction of decays to $\eta' \pi^+ \pi^-$ are determined for the $\eta_c(1S)$ and $\eta_c(2S)$, respectively. A new decay mode for the $\eta_c(1S) \rightarrow \eta' f_0(2080)$ with $f_0(2080) \rightarrow \pi^+ \pi^-$ is observed with a statistical significance of 20σ . The cross section for $\gamma\gamma \rightarrow \eta' \pi^+ \pi^-$ and $\eta' f_2(1270)$ are measured for the first time. We also report a measurement of the cross section for K^0_S pair production in single-tag two-photon collisions, $\gamma\gamma \rightarrow K^0_S K^0_S$ for Q^2 up to 30 GeV^2 , where Q^2 is the negative of the invariant mass squared of the tagged photon. The measurement covers the kinematic range $1.0 \text{ GeV} < W < 2.6 \text{ GeV}$ and $|\cos\theta| < 1.0$ for the total energy and kaon scattering angle, respectively, in the $\gamma^* \gamma$ center-of-mass system. For the first time, the transition form factor of the $f_2'(1525)$ meson is measured separately for the helicity-0, -1, and -2 components and also compared with theoretical calculations. Finally, the partial decay widths of the χ_{c0} and χ_{c2} mesons are measured as a function of Q^2 . The results are based on a data sample collected with the Belle detector at the KEKB asymmetric-energy $e^+ e^-$ collider.

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