

Charmonium decays at BESIII

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The BESIII Experiment at the Beijing Electron Positron Collider (BEPC2) has accumulated the world's largest samples of e^+e^- collisions in the tau-charm region. Using a sample of 106 million $\psi(3686)$ decays, the branch fractions of $\psi(3686) \rightarrow \gamma \chi_{c0}$, $\gamma \chi_{c1}$, $\gamma \chi_{c2}$ are determined to be $(9.389 \pm 0.014 \pm 0.332)\%$, $(9.905 \pm 0.011 \pm 0.353)\%$, and $(9.621 \pm 0.013 \pm 0.272)\%$, respectively. The branching fraction and the angular distributions of J/ψ and $\psi(3686)$ decays to Λ anti- Λ and Σ^0 anti- Σ^0 final states are measured. J/ψ and $\psi(3686)$ decays to $\Sigma(1385)^0$ anti- $\Sigma(1385)^0$ and Ξ^0 anti- Ξ^0 are measured. The decays to $\Sigma(1385)^0$ anti- $\Sigma(1385)^0$ are observed for the first time, and the angular parameters of these decays are also measured first time. Observation of hc radiative decay $hc \rightarrow \gamma \eta'$ and evidence for $hc \rightarrow \gamma \eta$. The branching fractions are measured to be $(1.52 \pm 0.27 \pm 0.29)/10^3$ and $(4.7 \pm 1.5 \pm 1.4)/10^4$, respectively. Both of them are the first observations. Measurement of higher-order multipole amplitudes in $\psi(3686) \rightarrow \gamma \chi_{c1,2}$ with $\chi_{c1,2} \rightarrow \gamma J/\psi$ and search for the $\eta_c(2S) \rightarrow \gamma J/\psi$ transition. The normalized magnetic-quadrupole (M2) amplitude for $\psi(3686) \rightarrow \gamma \chi_{c1,2} \rightarrow \gamma \gamma J/\psi$ and the normalized electric octupole (E3) amplitudes for $\psi(3686) \rightarrow \gamma \chi_{c2}$, $\chi_{c2} \rightarrow \gamma J/\psi$ are determined. The decays $\psi(3686) \rightarrow e^+ e^- \chi_{c0,1,2}$ and $\chi_{c0,1,2} \rightarrow e^+ e^- J/\psi$ are searched, and they are observed for the first time. Improved measurements of branching fractions for $\eta_c \rightarrow \phi \phi$ and $\omega \phi$. The branching fraction of $\eta_c \rightarrow \phi \phi$ is measured with improved precision. No significant signal for the double OZI-suppressed decay of $\eta_c \rightarrow \omega \phi$ is observed, and the upper limit on the branching fraction is determined.

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