Testing χ_c properties at BELLE II

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The integrated luminosity in the BELLE II experiment (20-50 ab^{-1}) will allow accessing information never available before. In this work we have shown how one can use it to study the χ_{c_i} properties.

Many models ([1]-[5]) correctly describe $\chi_{c_i} \to J/\psi\gamma$, $\chi_{c_i} \to \gamma\gamma$ and $\psi' \to \chi_{c_i}\gamma$ partial decay widths, but give different predictions for the widths $\Gamma(\chi_{c_1,c_2} \to e^+e^-)$. The model developed in [2] for χ_{c_1} and χ_{c_2} decays was extended to cover also the χ_{c_0} case. The model parameters were fitted using experimental data on $\Gamma(\chi_{c_0} \to \gamma\gamma)$, $\Gamma(\chi_{c_2} \to \gamma\gamma)$, $\Gamma(\chi_{c_i} \to J/\psi\gamma), i = 0, 1, 2$ and $\Gamma(\psi' \to \chi_{c_i}\gamma),\ i = 0, 1, 2$.

The model was implemented in the Monte Carlo event generator EKHARA to simulate reactions $e^+e^- \to e^+e^-\chi_{c_i}$ and $e^+e^- \to e^+e^-\chi_{c_i}(\to \gamma J/\psi(\to \mu^+\mu^-))$. Using the simulations with event selections close to the ones expected at BELLE II, it was found that it will be possible to study in detail $\chi_{c_i} - \gamma^* - \gamma$ form factors. These form factors are a crucial ingredient for the predictions of the χ_{c_1} and χ_{c_2} electronic widths and thus their measurement will differentiate between the models, even without direct measurement of the widths.

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