Effects of final state interactions on the calculation of branch ratio of $B_c^+ \rightarrow D^0 K^+$ decay

B Mohammadi
Department of Physics, Urmia University, Urmia, Iran
E-mail: be.mohammadi@urmia.ac.ir

(Received 22 September 2018; in final form 26 February 2019)

Abstract
In this paper, the decay of $B_c^+$ meson, which consists of two b and c heavy quarks, into the $D^0$ and $K^+$ mesons was studied. Given that the experimental branching ratio for this decay was within the range of $3.75 \times 10^{-5}$ to $11.16 \times 10^{-5}$; it was decided to calculate the theoretical branching ratio by applying the final state interaction (FSI) through the T and cross-section channels. In this process, before the $B_c^+$ meson was decayed into two final state mesons of $D^0 K^+$, it was first decayed into two intermediate mesons like $J/\psi D^{(*)}$; then, these two mesons were transformed into two final mesons by exchanging another meson like $D^0$. The FSI effects were very sensitive to the changes in the phenomenological parameter, which appeared in the form factor relation; this is since in most calculations, changing two units in this parameter makes the final result be multiplied by the branching ratio; therefore, the decision to use FSI was not unexpected. In this study, there were nineteen intermediate states in which the contribution of each one was calculated and summed in the final amplitude. Therefore, the numerical value of the branching ratio of $B_c^+ \rightarrow D^0 K^+$ decay was obtained by calculating the FSI effects from $1.17 \times 10^{-5}$ to $11.65 \times 10^{-5}$, which was consistent with the experimental results.

Keywords: standard model; factorization, final state interaction

For full article, refer to the Persian section