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Rediscovery of $D^0 \rightarrow K_S \pi^0$ with Belle II Detector

The Belle II collaboration

Abstract

This note reports the plots for the rediscovery of decay mode $D^{*+} \rightarrow D^0 \pi_s^+$, $D^0 \rightarrow K_S \pi^0$ with Belle II data corresponding to an integrated luminosity of 34.6 fb^{-1} . Details of this study are reported in the internal document BELLE2-NOTE-PH-2020-037.

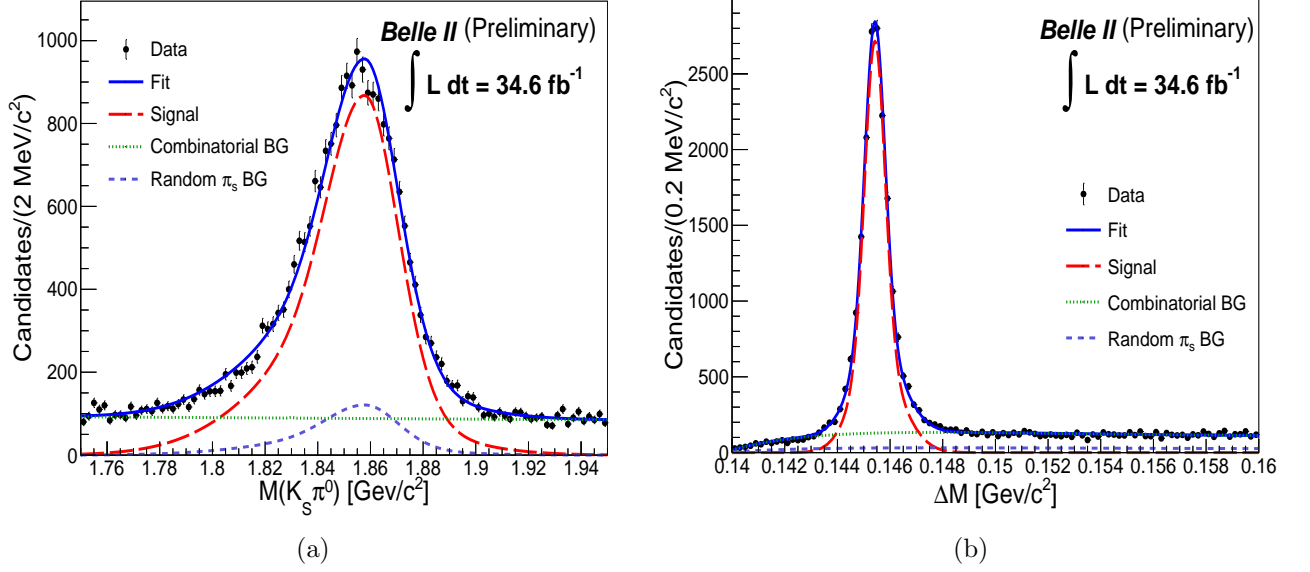


Fig. 1: Unbinned maximum likelihood 2D fit which is performed with (a) $M(K_S\pi^0)$ and (b) $\Delta M(M(K_S\pi^0\pi^+) - M(K_S\pi^0))$. To fit the signal component, sum of two gaussian and bifurcated gaussian functions is used for $M(K_S\pi^0)$, whereas sum of gaussian and bifurcated gaussian functions is used for ΔM distribution.

Exponential and threshold functions are used to fit a combinatorial background component in $M(K_S\pi^0)$ and ΔM , respectively.

Peaking (in $M(K_S\pi^0)$) background which is due to the combination of real D^0 candidates and fake soft pion (π_s) candidates is fitted by using sum of two gaussian and bifurcated gaussian functions in $M(K_S\pi^0)$ whereas this background contribution is fitted with threshold function in ΔM .

The signal, combinatorial background and random π_s background are shown with red dashed, green dotted and purple dashed lines, respectively.

Observed yield for $D^{*+} \rightarrow D^0\pi_s^+$, $D^0 \rightarrow K_S\pi^0$ with Belle II data corresponding to an integrated luminosity 34.6 fb^{-1} is 16800 ± 150 , where uncertainty is only statistical. Details about this study are reported in the internal document BELLE2-NOTE-PH-2020-037.