

The interference effects of multi-channel pion-pion scattering contributions to the final states of Ψ - and Υ -meson family decays

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Collaboration

Abstract content

There is presented a unified analysis of all available data on the decays of bottomonia $\Upsilon(mS) \rightarrow \Upsilon(nS)\pi\pi$ ($m > n$, $m = 2, 3, 4, 5$, $n = 1, 2, 3$), charmonia $J/\psi \rightarrow \phi(\pi\pi, K\bar{K})$, $\psi(2S) \rightarrow J/\psi\pi\pi$ and the data on isoscalar S -wave processes $\pi\pi \rightarrow \pi\pi, K\bar{K}, \eta\eta$. The multi-channel $\pi\pi$ scattering is described in our model-independent approach based on analyticity and unitarity and using an uniformization procedure. It is shown that the basic shape of dipion mass distributions in the two-pion transitions of both charmonia and bottomonia states are explained by a unified mechanism based on the contribution of the $\pi\pi$, $K\bar{K}$ and $\eta\eta$ coupled channels including their interference. The role of the individual f_0 resonances in contributing to the dipion mass distributions in indicated decays of these states is considered. Since the satisfactory description of these decays with allowing for the $\eta\eta$ channel (in addition to the $\pi\pi$ and $K\bar{K}$ one) did not require any change of the f_0 -meson parameters, the results of the analysis confirm convincingly all of our earlier conclusions on the scalar mesons.

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[2] Yu.S. Surovtsev et al., Phys. Rev. D 89 (2014) 036010.

[3] Yu.S. Surovtsev et al., Phys. Rev. D 91 (2015) 037901.

[4] Yu.S. Surovtsev et al., Phys. Rev. D 92 (2015) 036002.

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