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## Model-independent measurement of the CKM phase $\varphi_1$ in $b \rightarrow c\bar{u}d$ transitions

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A time-dependent analysis of the  $B$  meson decays governed by  $b \rightarrow c\bar{u}d$  quark transition allows to measure the CKM angle  $\varphi_1$  with a negligible effects of strong interactions. The binned Dalitz plot technique is a promising approach for a model-independent measurement of the angle  $\varphi_1$  in the  $B^0 \rightarrow \bar{D}^0 \pi^0$  and  $B^0 \rightarrow \bar{D}^0 \pi^+ \pi^-$  decays followed by  $\bar{D}^0$  decays into  $K_S^0 \pi^+ \pi^-$  and CP-eigenstates. We apply this technique to a full data sample of the Belle experiment and perform a time-dependent analysis of  $B^0 \rightarrow \bar{D}^{(*)0} h^0$ ,  $\bar{D}^0 \rightarrow K_S^0 \pi^+ \pi^-$  decays, where  $h^0 \in \{\pi^0, \eta^{(\prime)}, \omega\}$ . The obtained value  $\cos 2\varphi_1 = 1.06 \pm 0.33_{-0.15}^{+0.21}$  is the most precise single measurement of the  $\cos 2\varphi_1$  to date and resolves the twofold ambiguity at the confidence level exceeding five standard deviations. The binned Dalitz plot technique can be employed to measure the angle  $\varphi_1$  in the  $b \rightarrow c\bar{u}d$  transitions at the precision level of one degree with expected statistics of the LHCb and Belle II experiments. Such precise results together with measurements of the  $b \rightarrow c\bar{c}s$  transition would provide a valuable check of the KM mechanism.

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