

31st International Symposium on Lepton Photon Interactions at High Energies



Contribution ID: 182

Type: **Talk**

Recent Belle II results on time-dependent CP violation and charm physics

Tuesday 18 July 2023 14:45 (15 minutes)

Time-dependent measurements of CP violation are chief goals of the Belle II physics program. Comparison between penguin-dominated $b \rightarrow q\bar{q}s$ and tree-dominated $b \rightarrow c\bar{c}s$ results allows for stringent tests of CKM unitarity that are sensitive to non-SM physics.

This program requires excellent vertexing capabilities. After presenting recent world-leading results on charm-hadron lifetimes that demonstrate the Belle II vertexing performance, we report on recent results on $B^0 \rightarrow K_S\pi^0$, $B^0 \rightarrow K_S K_S K_S$, and $B^0 \rightarrow \phi K_S$ decays. In addition, a novel algorithm to identify the flavor of neutral charm mesons is presented that effectively doubles the sample size for many measurements of CP violation and flavor mixing.

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Session Classification: Flavour

Track Classification: Flavour physics