

# Utilising $B \rightarrow \pi K$ Decays at the High-Precision Frontier

*Tuesday, 8 May 2018 11:15 (1 hour)*

The  $B \rightarrow \pi K$  decays have received a lot of attention over the last two decades, with puzzling patterns in the previous data. They form a particularly interesting set of decays as they are dominated by QCD penguin topologies. Electroweak penguin topologies also play a significant role, giving a contribution at the level of the tree topologies. We show that a previous discrepancy in the correlation between the CP asymmetries of  $B_d^0 \rightarrow \pi^0 K_S$  has grown stronger, in particular due to more precise measurements of the unitarity triangle angle  $\gamma$ . A modified electroweak penguin sector offers an attractive avenue for new particles to enter. Particularly interesting are models with extra  $Z$ 'bosons, which are also considered as an explanation of the current data for rare  $B \rightarrow K^{(*)} \ell^+ \ell^-$  decays. We provide a new method to determine the electroweak penguin parameters, and apply it to current data for charged  $B \rightarrow \pi K$  decays. Moreover, we discuss utilizing CP violation in  $B_d^0 \rightarrow \pi^0 K_S$ , for which Belle II offers excellent prospects. The implementation of our strategy at Belle II has the exciting potential to establish New Physics in the electroweak penguin sector.

## Teaser (will appear on the printed program)

New tensions in  $B \rightarrow \pi K$  data are uncovered, which can be resolved by a modified EW penguin sector. We present a strategy to reveal the underlying physics.

**Primary author:** JAARSMA, Ruben (Nikhef)

**Co-authors:** Ms MALAMI, Eleftheria (Nikhef); Dr VOS, Keri (Siegen University); Prof. FLEISCHER, Robert (Nikhef)

**Presenter:** JAARSMA, Ruben (Nikhef)

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