

# Search for hadron exotics in the new decay modes of the $B^0$ meson at LHCb

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Spectroscopic studies of multi-quark hadrons in the charmonium sector are crucial in providing powerful insights into the intricacies of quantum chromodynamics (QCD) in the non-perturbative regime. Describing these hadrons as bound quark systems from first principles is challenging, but experimental observations in the last 20 years have driven the progress, with the discovery of nearly 30 exotic hadron candidates. It is this pattern of one unexpected result after another, with the emergence of desperately few connections, that has characterized the studies in this field. The LHCb experiment, with its unique capability to cover the large heavy-quark production cross-section at the LHC, offers a great window of opportunity to explore heavy hadron spectroscopy, in both the conventional and exotic sectors.

This presentation is a synopsis of our work in search of QCD exotica in two new decay modes of the  $B^0$  meson, which are  $B^0 \rightarrow J/\psi \pi^+ \pi^- \pi^0 K^- \pi^+$  and  $B^0 \rightarrow J/\psi \omega K^- \pi^+$ . In each case we measure the Branching fraction and search for higher charmonium exotics as intermediate states in the LHCb data, collected from Run 1 (2011-2012) and Run 2 (2015-2018) in proton-proton collisions.

**Presenter(s) :** JOSHI, Salil (NCBJ)