Contribution ID: **22** Type: **Parallel talk**

Search for charge-parity violation in radiative charm $D^0 \to \phi\gamma$ decays

Monday 7 April 2025 16:30 (15 minutes)

Radiative decays of charmed hadrons are highly sensitive to flavor-changing processes, which are governed by the Standard Model (SM) but could also be influenced by new physics (NP). This sensitivity arises due to the Glashow-Iliopoulos-Maiani (GIM) suppression mechanism, which significantly restricts processes such as $|\Delta c| = |\Delta u| = 1$. The radiative charm decay $D^0 \to V\gamma$, where $V = \bar{K}^{*0}$ (Cabibbo-favored) or ϕ, ρ^0, ω (Cabibbo-suppressed), is particularly sensitive to indirect NP effects due to its significant loop amplitude. Within the SM, Charge-Parity (CP) violation in charm decays is expected to be small, making radiative decays an excellent probe for potential NP beyond the SM.

This work presents one of the first searches for CP violation in $D^0 \to \phi\gamma$ decays using data collected during Run 2 of the LHCb experiment at the Large Hadron Collider (LHC), CERN, Switzerland. The analysis is performed on proton-proton collision data corresponding to an integrated luminosity of approximately 6 fb^{-1}, recorded at a center-of-mass energy of 13 TeV. The D^0 mesons are reconstructed from $D^{*+} \to D^0\pi^+$ decays, allowing for the determination of the initial flavor state. A three-dimensional simultaneous fit technique is employed to extract the signal yield while mitigating large background contributions from π^0 and combinatorial decays. This study utilizes the unique capabilities of LHCb, including high-statistics data, precise vertex reconstruction, improved triggers during Run 2, and excellent photon detection, to set the most stringent constraints on CP violation in this rare charm decay mode. A significant deviation from the SM expectation of CP asymmetry at the order of 10^{-3} could indicate contributions from physics beyond the SM.

Keywords: CP violation, radiative charm decays, LHCb, new physics, beyond the Standard Model.

Author: Mr BOHARE, Abhishek (The University of Edinburgh (GB))

Co-author: WILLIAMS, Mark Richard James (The University of Edinburgh (GB))

Presenter: Mr BOHARE, Abhishek (The University of Edinburgh (GB))

Session Classification: Collider Physics - Flavour

Track Classification: Collider Physics - Flavour