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Title:	Search for non-resonant $B^0 \rightarrow J/\psi K^0 \bar{K}^0$ decay at CERN-LHC-CMS ($\sqrt{s} = 13.6$ TeV)
Authors:	Pipraiya, Shreya
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Abstract:	The Compact Muon Solenoid (CMS) at the Large Hadron Collider (LHC), CERN (Conseil européen pour la Recherche Nucléaire) is a general purpose detector for probing Standard Model physics. The ongoing, third operational phase (Run 3) of the LHC witnesses the CMS experiment operating at a remarkable collision energy of 13.6 trillion electronvolts (13.6 TeV) and a luminosity of 22.17 fb ⁻¹ (22.17 fb ⁻¹). The $B^0 \rightarrow J/\psi K^0 \bar{K}^0$ decay channel, where J/ψ decays to $\mu^+ \mu^-$ and $K^0 \bar{K}^0$ decays to $p^+ p^-$ final state, is a rare decay with a low branching ratio and offers a unique window into flavor physics. Flavor physics involving B meson decays has played a crucial role in the baryon asymmetry and CP violation studies. This decay process is significantly enhanced with intermediate particles (ρ^0 and f_0), which can further decay to $K^0 \bar{K}^0$. The Cut and Count method and Boosted Decision Trees (BDT) method are implemented to search for non-resonant (decay without an intermediate) decay of $B^0 \rightarrow J/\psi K^0 \bar{K}^0$ as it has never been observed before. The analysis is done using simulated Monte Carlo (PYTHIA8, GEANT4) and experimental proton-proton collision data (CMS-Run3).
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