

High-mass dimuon resonances in Pb+Pb collisions at 5.5 TeV/c²

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Abstract

Z^0 boson is an important probe to study the Nuclear Shadowing of Parton Distribution Function in the Heavy Ion Collision at LHC at $\sqrt{s} = 5.5\text{TeV}$. The factor 30 increase in energy between RHIC and LHC decrease the x values from 0.02 to 6.7×10^{-4} . Since the dominant contribution of Z^0 production is through quark antiquark fusion, it is an unique probe to study the nuclear effect of quark PDF at very low x upto very high Q^2 . The Compact Muon Solenoid (CMS) detector with its excellent muon detection capability for a wide range of energy and rapidity, is absolutely suitable to study the Z^0 bosons through the decay muons. Being a very clean signal $Z^0 \rightarrow \mu^+ \mu^-$ is also considered to be the alternative baseline for quarkonium suppression.

In this work we will report the reconstruction capability of the $Z^0 \rightarrow \mu^+ \mu^-$ signal in the Heavy Ion Collision for CMS detector using CMSSW software framework. According to the estimation by PYTHIA, around 19000 Z^0 is expected for one month of LHC run with Pb+Pb beam at \sqrt{s} 5.5 TeV with integrated luminosity $L_{int} = 0.5\text{nb}^{-1}$. The possible pQCD backgrounds are muons from open beauty, charm and Drell-Yan. The Heavy ion background is mostly decay muons from π and K mesons. HYDJET event generator is used for Heavy Ion background study. Signal to background ratio for $Z^0 \rightarrow \mu^+ \mu^-$ within CMS detector acceptance will be reported. Reconstruction efficiency, invariant mass, p_T , η and rapidity distribution of Z^0 signal for different centrality of Pb-Pb Collision will be estimated.