Simulation for CMS HI

Dipanwita Dutta

Nuclear Physics Division

Bhabha Atomic Research centre

Mumbai, India

Outline

- **Review of Simulation and Reconstruction of Z^0 with CMKIN+OSCAR+ORCA**
- **Muon Reconstruction with CMSSW—Present Status**
- **Future Plan**

Introduction

Heavy Quark Vector Meson (Υ,J/ψ, ψ′) supprerssion is one of strongest signature of QGP

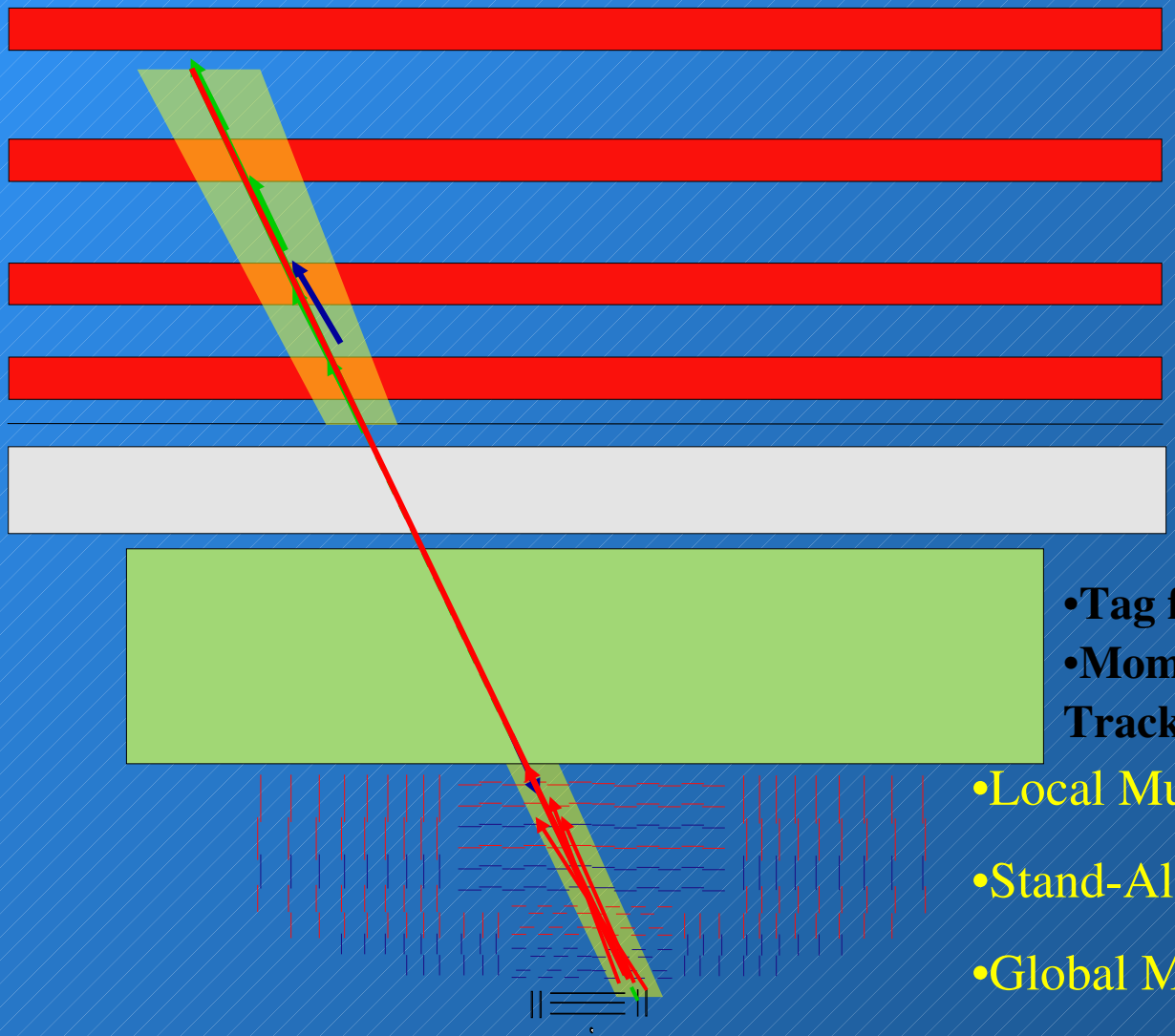
Detection of $Z^0 \rightarrow \mu^+\mu^-$ at the same impact parameter will provide a good reference to estimate the suppression

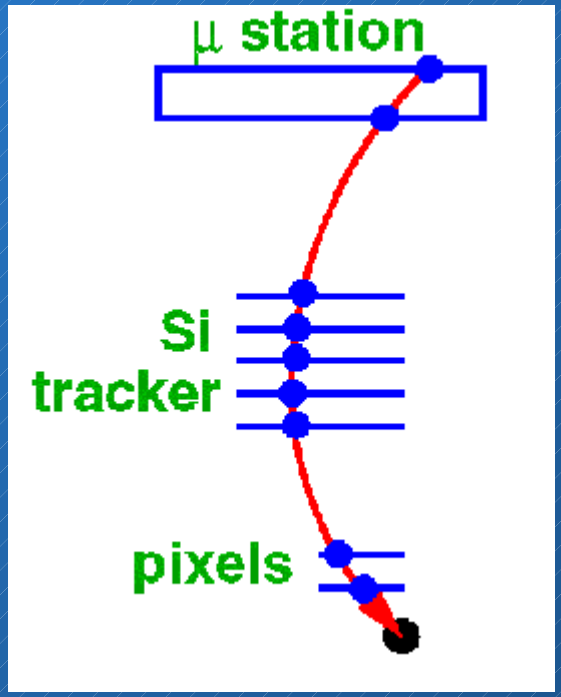
Z^0 is an important signal for studying the Nuclear shadowing effect

Cross-section and No. of Z^0 for Pb+Pb collision $\sqrt{s}$=5.5 TeV for L_{int}=0.5 nb^{-1}

Processes	**Cross-section from PYTHIA σ_{pp} (Z^0) PDF CTEQ5M**	**Cross-section from PYTHIA σ_{pp} (Z^0) PDF CTEQ5ML**	**No. of Z^0 for central collision (CTEQ5M) $\sigma_{AA}=T_{AA}(0)\times\sigma_{NN}\times\sigma_{pp}$ (Z^0)**	**No. of Z^0 for minbias collision $\sigma_{AA}=A^2\times\sigma_{pp}$ (Z^0)**
Z^0	48 nb	54 nb	4.3×10^4	1.03×10^6
For CMS p_T>3.5 GeV $\|\eta\|$<2.4				
m_Z-5<$M_{\mu\mu}$< m_Z+5	6.9×10^{-1} nb	7.7×10^{-1} nb	621	1.4×10^4

Muon Reconstruction



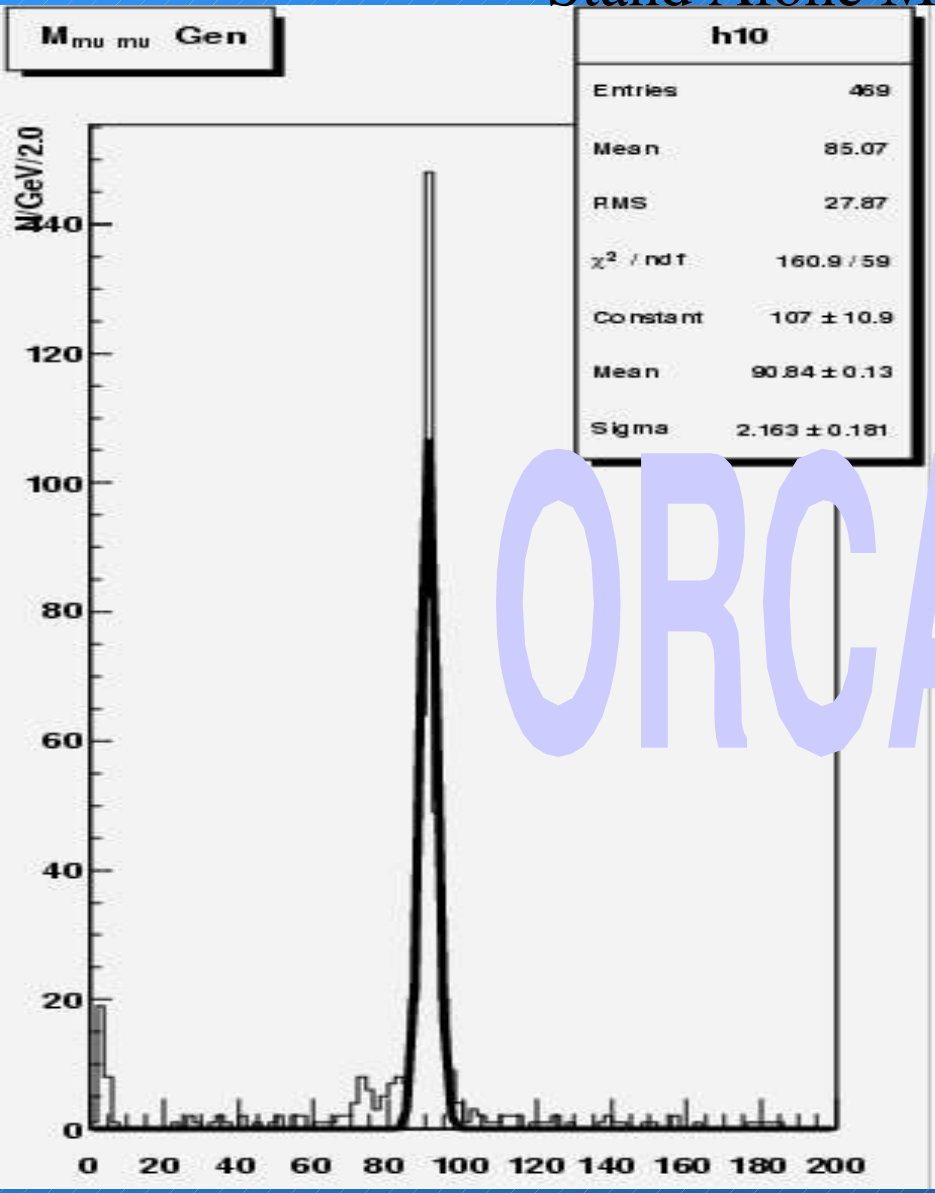


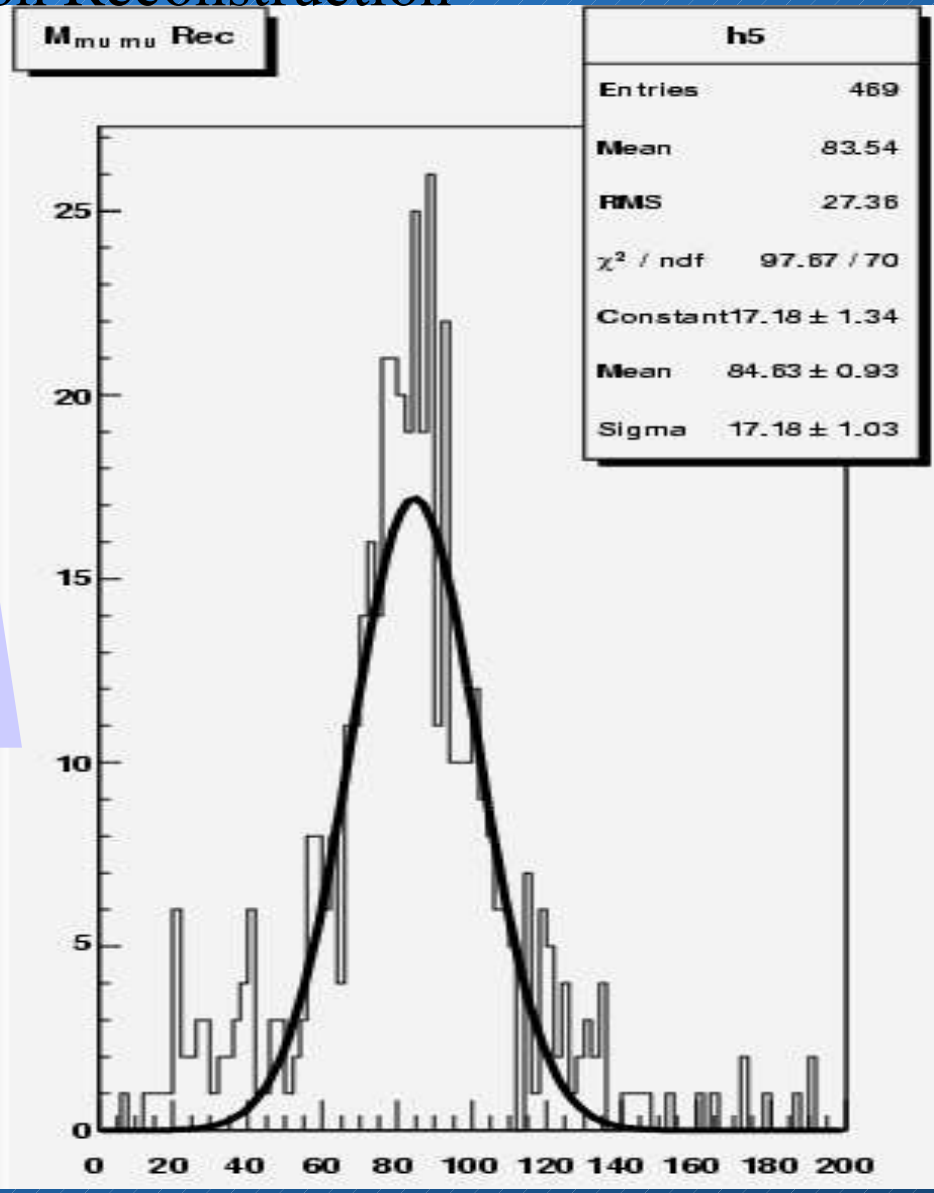
- **Tag from Muon chambers**
- **Momentum resolution from Silicon Tracker**
- Local Muon Reconstruction (L1)
- Stand-Alone Muon Reconstruction (L2)
- Global Muon Reconstruction (L3)

(Combined with Tracker)

Reconstruction with HI Background

Stand Alone Muon Reconstruction





Summary : CMKIN-OSCAR-ORCA

- **Generation, Simulation and Reconstruction of Z^0 performed with HI background using full CMS simulation package CMKIN, OSCAR, ORCA**

- **Stand Alone Muon Reconstruction show poor mass resolution, Mass width~ 18 GeV at Z^0 mass ($\Delta m/m \sim 0.2$)**

- **Global Muon Reconstruction with Tracker: Mass Resolution with HI background to be studied --- No further Support for ORCA**

Reconstruction with CMSSW (Using Reconstruction algorithm for pp)

- **CMSSW_1_2_2 downloaded and installed locally at BARC**

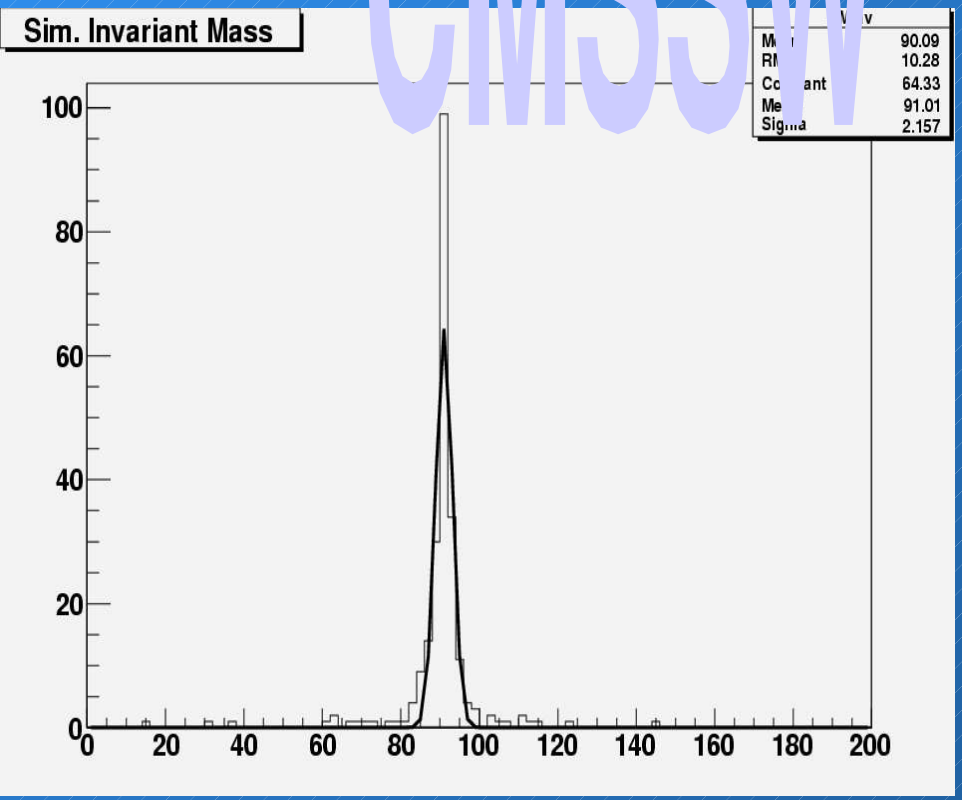
- **Reconstruction using pp algorithm:**

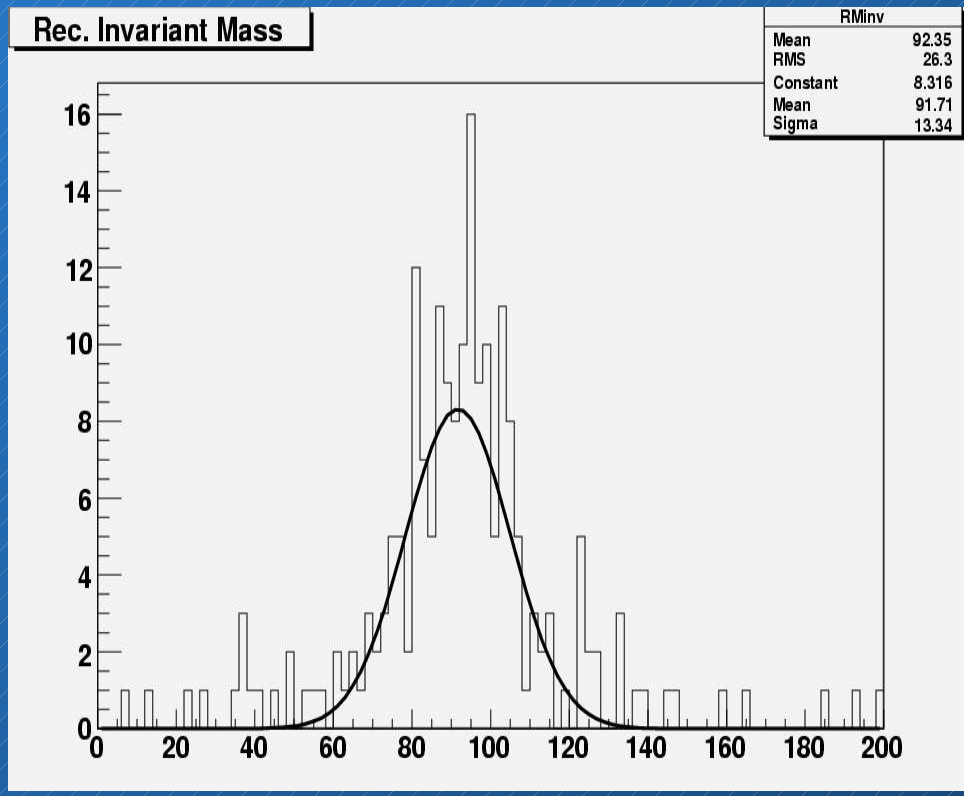
  Z^0 Generation with PYTHIA using CMSSW Generator Interface -- Simulation+ Digitization--Local + Stand Alone Muon Reconstruction

Generated and Reconstructed Invariant Mass

CMSSW

$\Delta m \sim 14$ GeV





Muon Reconstruction Algorithm in HI for CMSSW

- Muon Stand Alone Reconstruction for HI (RecoHIMuon for CMSSW_1_3_0 have been checked in CVS last month)
- The Compilation of HI Reco Software and checked with sample Rel Val Data file from DBS
- Didn't get proper cfg file under CMSSW_1_3_0 for Z0 Pythia Gen+sim+rec
- Tested Z0 pythia+sim+gen using CSA07_Zmumu_GEN_SIM.cfg file under CMSW_1_4_2
- RecoHIMuon checked to CMSSW_1_5_0 last week by Olga

Muon Reconstruction (Future Plan)

- Check the RecoHIMuon for Z0 Pythia file
- Do the Global tracking—Glue the tracks from Tracker with the Muon Seed Generator --still under development
- Complete the muon Reconstruction for Z0 muons if possible with HI background and put it as Analysis Note

Thank You