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hZZ4mu:
Underlying Events: first results

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Introduction

▷ Idea is to get an estimation of the UE systematic effect (in particular on isolation efficiency) due to uncertainty on UE events multiplicity

  ▷ main parameter to tune in MC is PT_{cut_off} for UE

  ▷ in PYTHIA: $PT_{cut\_off} = PARP(82)*(14000/PARP(89))^{PARP(90)}$

   ▷ we use PARP(89) = 14000

   ▷ PARP(82) = 2.9 → PT_{cut_off} = 2.9 GeV – default scenario

   ▷ PARP(82) = 2.4 → PT_{cut_off} = 2.4 GeV – pessimistic scenario

   ▷ PARP(82) = 3.4 → PT_{cut_off} = 3.4 GeV – optimistic scenario

  ▷ difference in PT_{cut_off} values 0.5 GeV is about 3σ of corresponding variation of the parameter (tuned and extrapolated from data)

   ▷ for more details look at CERN Yellow report 2000/004

   ▷ Paolo Bartalini (UF) is one of the contact persons and is working on a proposal of the common strategy of UE systematic studies at CMS

  ▷ We use for investigation tt and mh115, 150, 200, 400 at generator level (standard production card used)

   ▷ just a first step, since magnetic field clearly strongly affects soft PT tracks

 ▷ work is in progress, some preliminary results presented here

UE: preliminary results

▷ **Isolation efficiencies variations**

    ▷ signal, m_H = 150 GeV

    ▷ a la analysis cuts applied (cuts on 4 selected muons PT>16 GeV, inv. masses of Z1, Z2 > 12 GeV, 147.5 < m_H < 152.5)

    ▷ shown results are for

        ▷ dR(η,φ) cone size = 0.3

        ▷ PT of considered tracks in a cone > 0.5 GeV (dashed line) OR > 2.0 GeV (solid line)

        ▷ only charged tracks considered

    ▷ event counted as "isolated" if all 4 selected muons are isolated
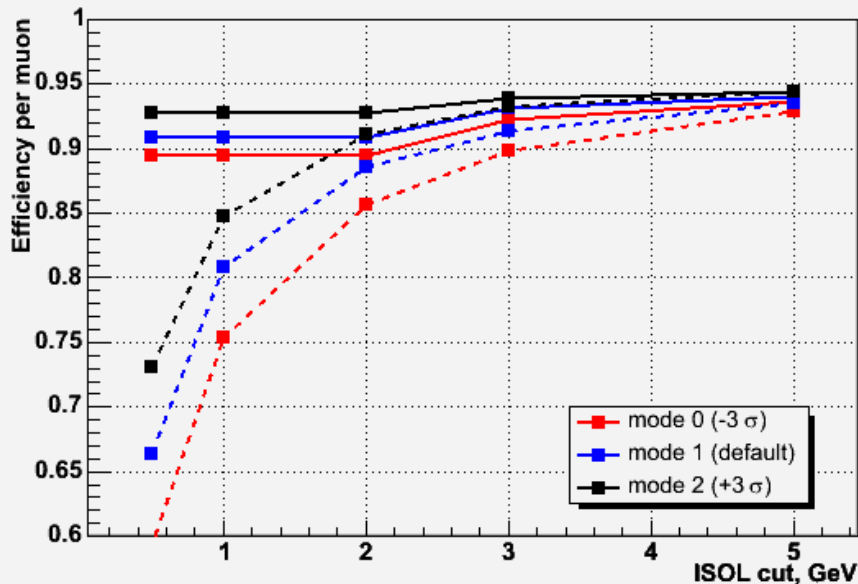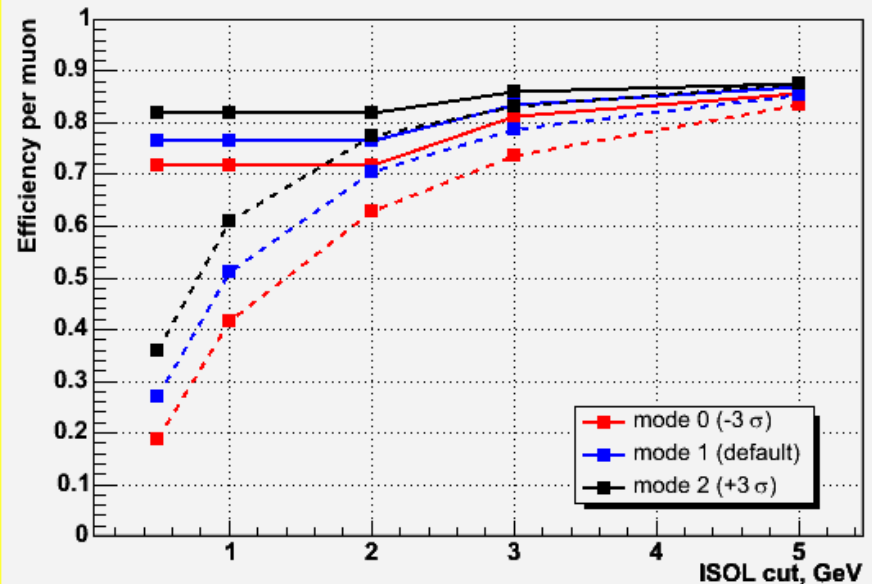
Summary and Plans

▷ **Preliminary results**

  ▷ Effect is at the level 15-20% for signal isolation inefficiency

    ▷ need to go to cut set closer to full analysis one (in particular have different isolation cuts to each of four muons when they are sorted by isolation parameter)

  ▷ Finalize calculations for the tt background (and signal)

    ▷ go to full simulation

  ▷ Get an estimation of a systematic effect due to UE uncertainty on isolation efficiency → to be used in the full analysis (in particular in the H→ZZ→4μ analysis by UF and CIEMAT)

  ▷ Have this study as an example how UE uncertainty can influence analysis results → to be used in other analysis

  ▷ Prepare a Note

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