# 3D Lifetime and RegIT muon

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Eta – pT efficiency of single muons

- Acceptance ranges, muon ID variable cuts are determined without RegIT algorithm
  - Need to check them with RegIT
- Apply acceptance cut ranges, muon ID variable cuts and check single muon's eta-p_T efficiency 2D map

- Case1) HLT_HIL1DoubleMu0_HighQ + Dimuon mass [2.6, 3.5] GeV/c^2
- Case2) No trigger selection + Dimuon mass [2.6, 3.5] GeV/c
- Case3) No trigger selection + No dimuon mass range selection
- Below conditions are common to all cases
  - Opposite sign pairs
  - Dimuon |y| < 2.4

# Single muon eta-p$_T$ 2D map (PbPb)
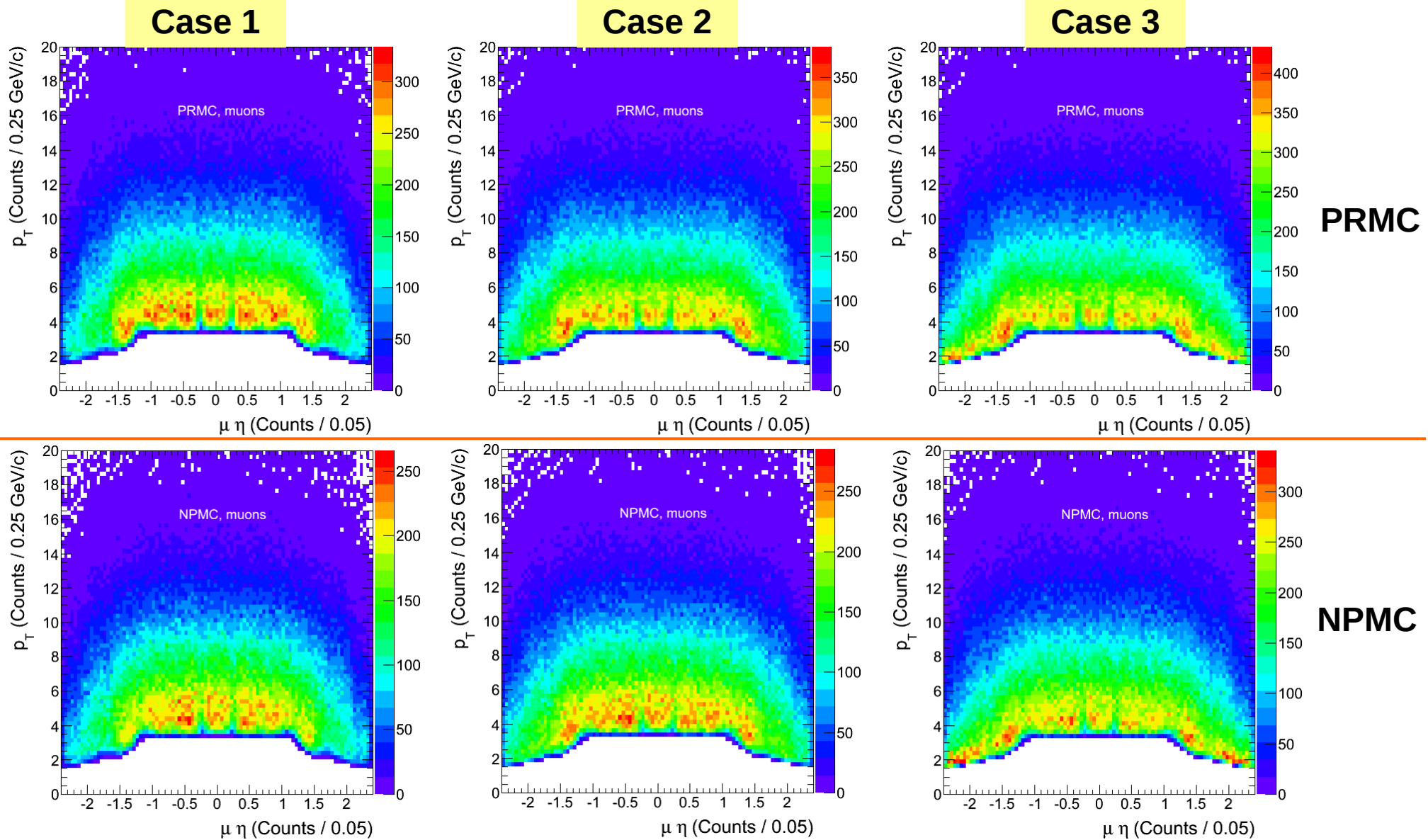
- Sharp holes are found at mid-rapidity region
- Trigger selection or mass range selection does not change distributions much

3D lifetime

- Lifetime is built with (x,y) dimension: Lxy, PV, SV

- Having full lifetime in (x,y,z) dimension
  - Uses full momentum, not transverse momentum
    - According to Roberto, it is not good to use this because
      - $p\_z(mu)$ is not directly measured in the B field → Worse resolution
      - The distance between PV and SV can be slightly better
  - Requires to re-skim RD and MC

- Resolution of $p_{xy}(=p_T)$ and p_z are tested by (reco-gen)/gen with PbPb PRMC and NPMC
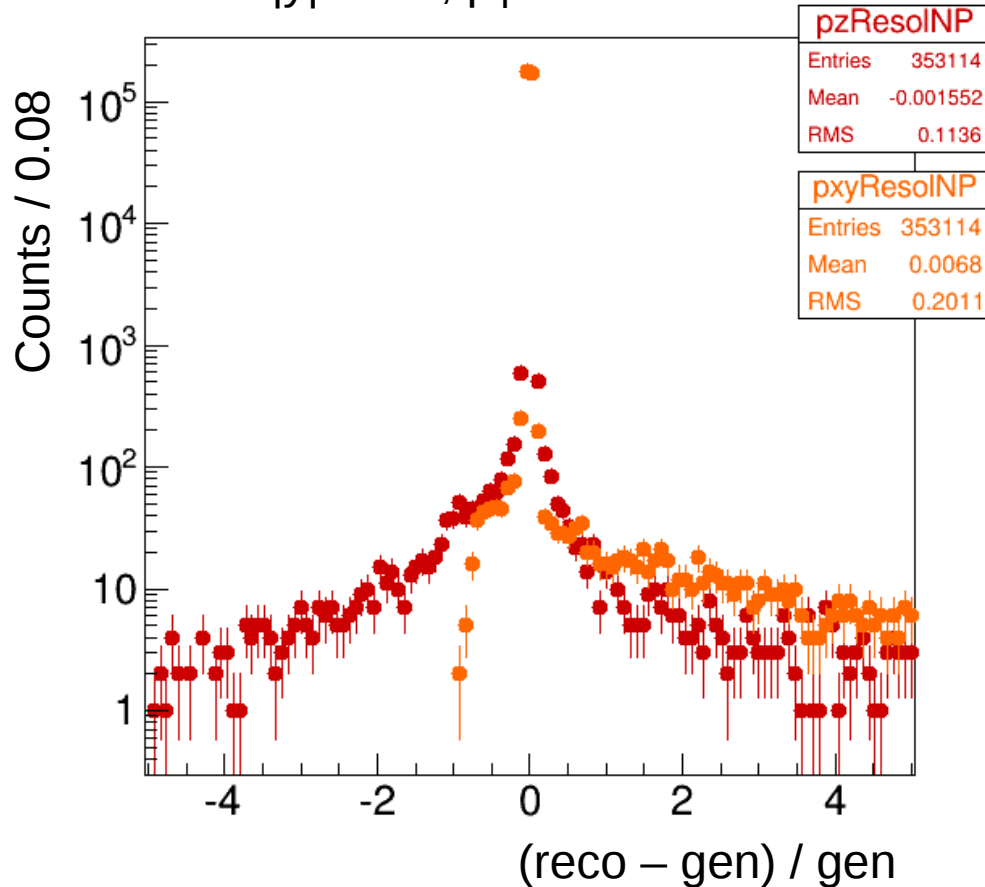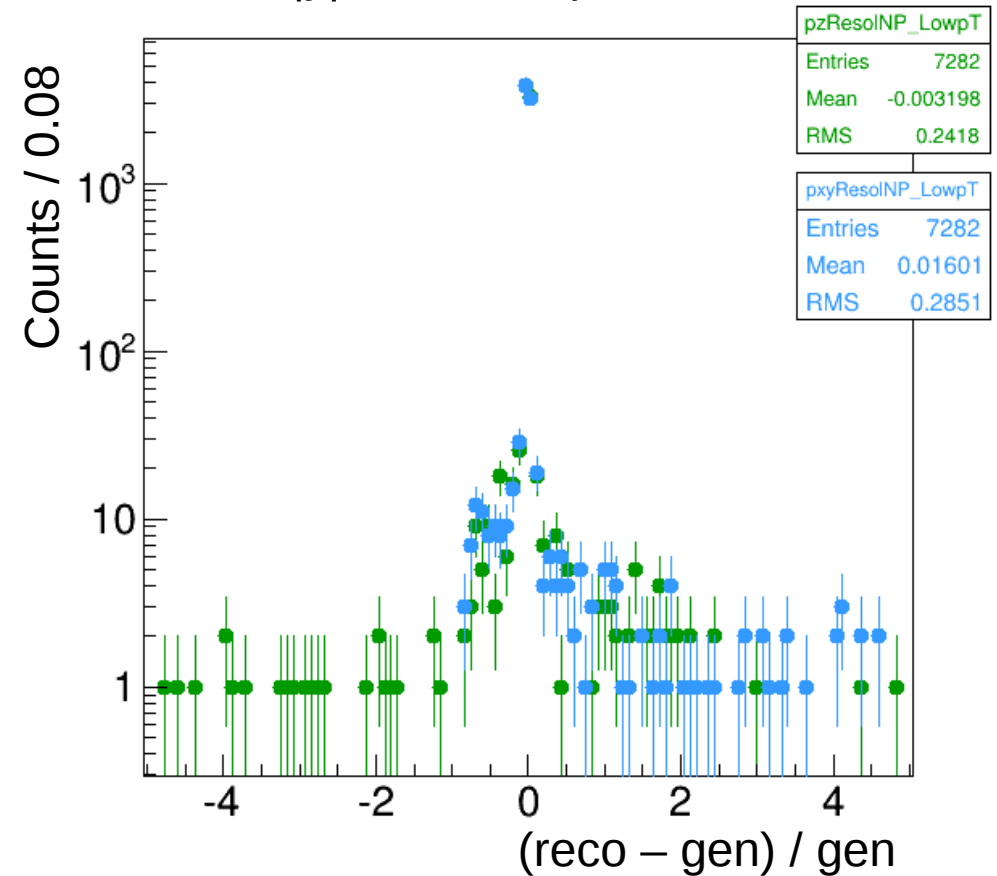
Resolution of pxy and pz in PRMC (PbPb)
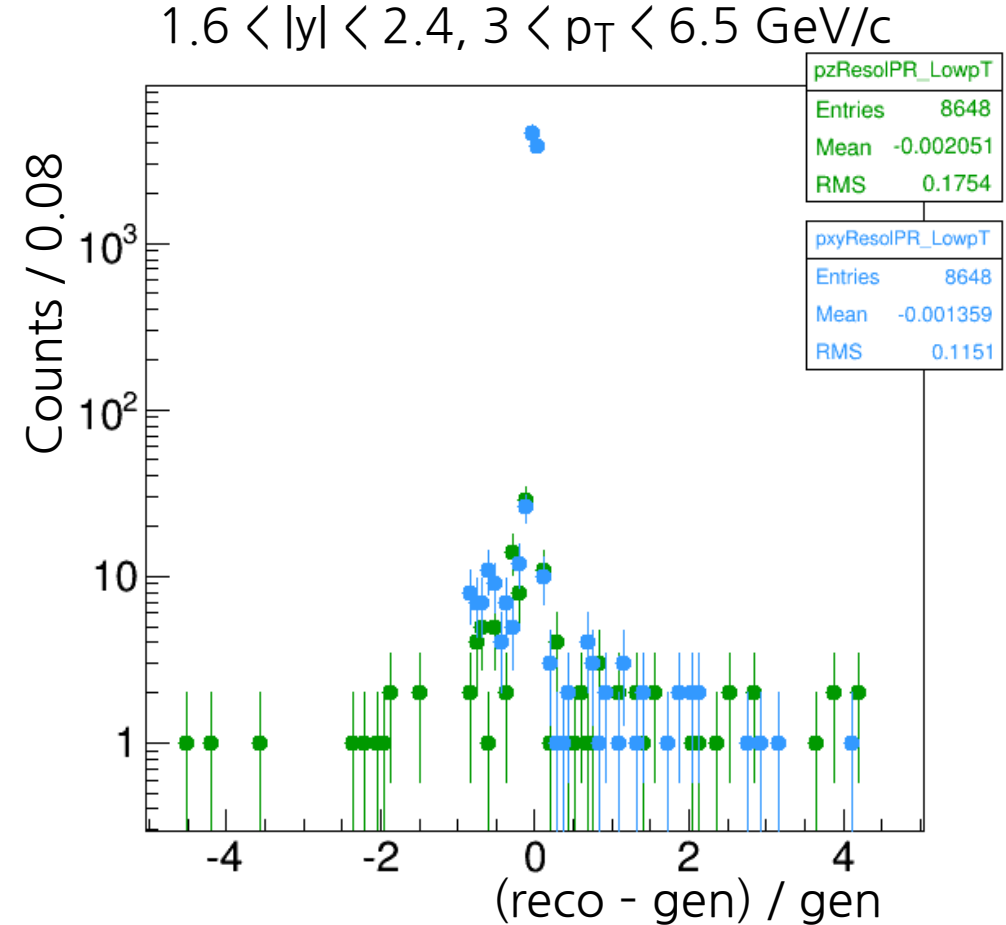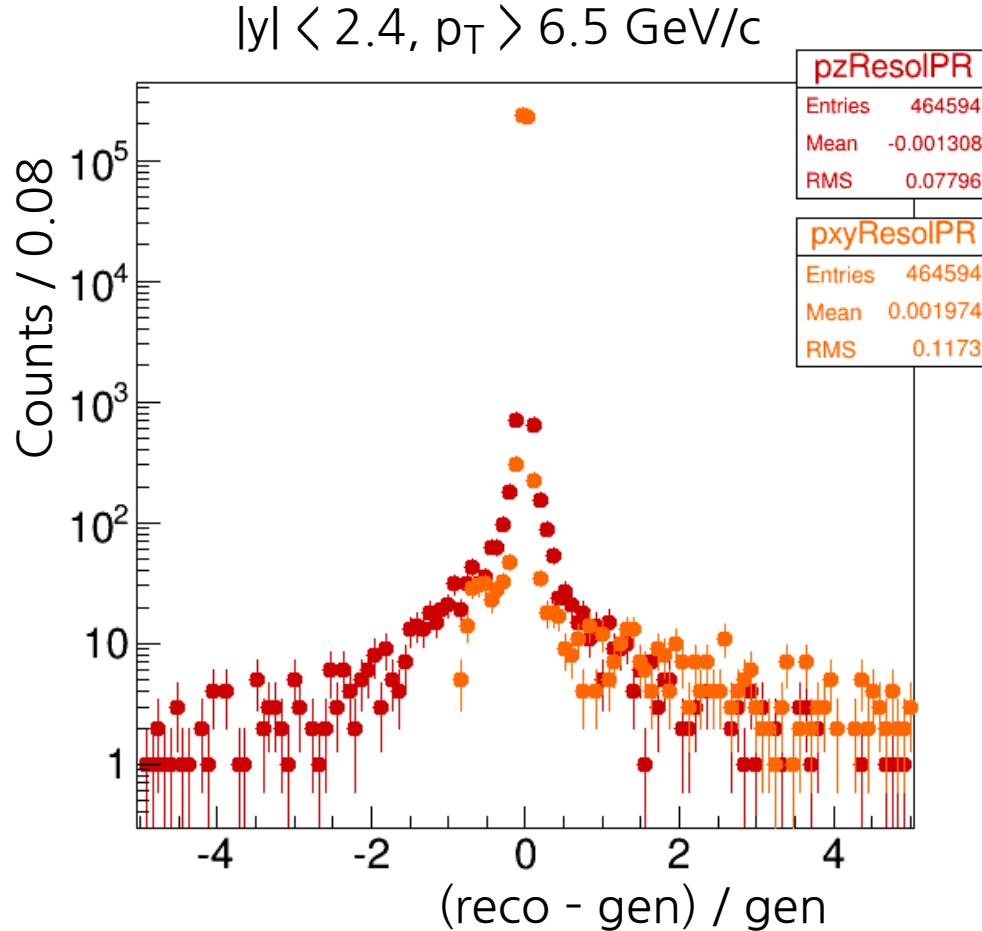
- Compare to Pxy resolution, Pz resolution has wider width
- Forward & low-p_T region has low statistics to draw a same conclusion as in high-p_T region

Resolution of pxy and pz in NPMC (PbPb)

$|y| < 2.4$, $p_T > 6.5$ GeV/c

$1.6 < |y| < 2.4$, $3 < p_T < 6.5$ GeV/c

- Compare to Pxy resolution, Pz resolution has wider width
- Forward & low-p_T region has low statistics to draw a same conclusion as in high-p_T region