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Tag And Probe / BPAG Offline DQM

Purpose

The purpose of this page is to document Muon HLT Offline DQM for tag and probe with muon resonances. The monitoring from Tag and Probe is supplemental to the baseline Muon HLT Offline DQM. The software was developed by the members of both the B PAG and the Muon HLT group. The resonances monitored are J/Psi, Upsilon, and Z.

What selection is applied to muons?

```
Probe track = tracker track
d0cut = 2.0
z0cut = 25.0
RECO Muon Requirements: "pt > 0.5 && abs(eta) < 2.1 "
HLT Muon Requirements: "pt > 0.5 && abs(eta) < 2.1 "

Tag track = inner track
tagD0cut = 2.0
tagZ0cut = 50.0
tagRecoCuts = "pt > 1.0 && abs(eta) < 2.1 "
tagHltCuts  = "pt > 1.0 && abs(eta) < 2.1 "
```

Which triggers are monitored?

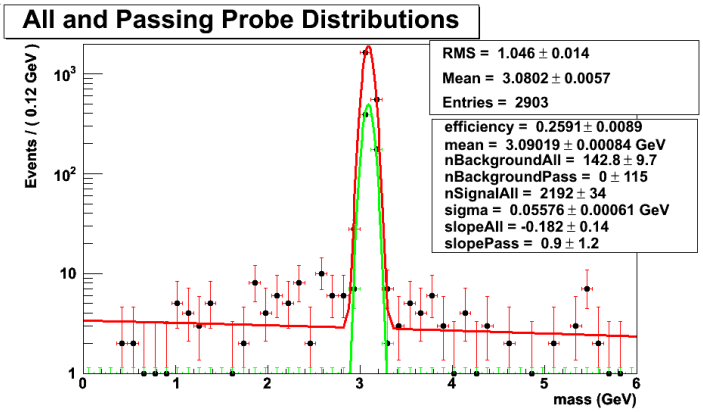
We monitor `HLT_Mu3, HLT_Mu5` and `HLT_Mu9` at each resonance.

How are the fits run?

- We produce two invariant mass distribution for all tag and probe pairs in each bin of our kinematic variable of interest (pt, eta, phi, etc). The two distributions represent the numerator and the denominator of the efficiency measurement. The denominator is all RECO muon pairs, and the numerator is RECO muon pairs where the probe leg passes the trigger.
- In each bin, we simultaneously fit the numerator and denominator invariant mass distributions. The fit scans through values of efficiency looking for a value of the efficiency that maximizes the likelihood. In pseudo code, this might look like:

```
1. Start with an initial efficiency guess, e.g. 50%
2. Fit Denominator and Numerator simultaneously with separate Guassian + Linear funct
   with the constraint the Numerator / Denominator = Efficiency
3. Record the likelihood from the fit with that efficiency constraint.
4. Try some other efficiency guesses near the original guess, and map how the fit lik
    changes with efficiency
5.  Use a gradient descent method to fit the value of efficiency that maximizes the l
```

- This choice of fit procedure has the benefit of a natural definition of error. The error on the efficiency is the 68% confidence band on the likelihood.
- Example of a simultaneous fit of a numerator a denominator mass distribution in one bin of Pt:



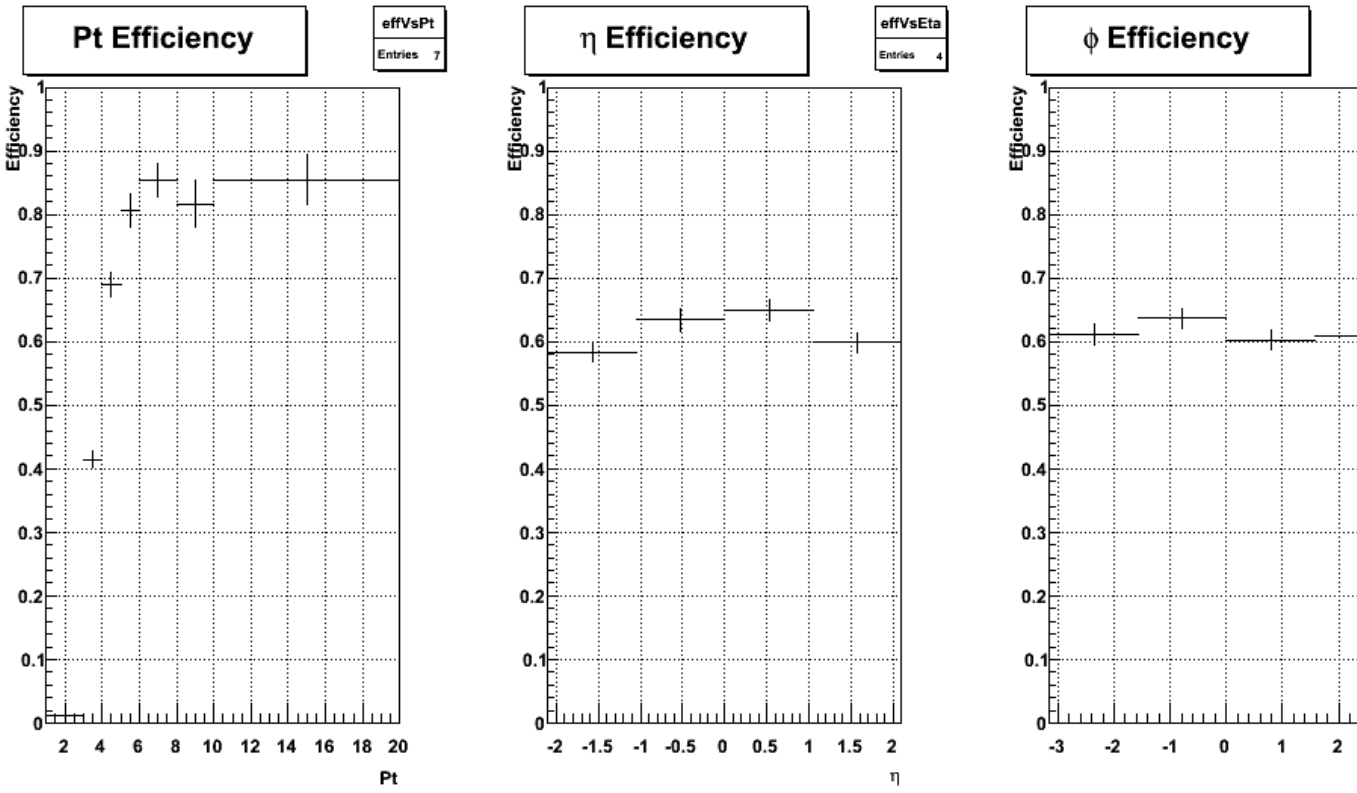
Example Efficiency Plots

These efficiency plots were made by running on dimuon resonance samples.

J/PSI HLT_MU3

J/PSI: 330_pre3 relval

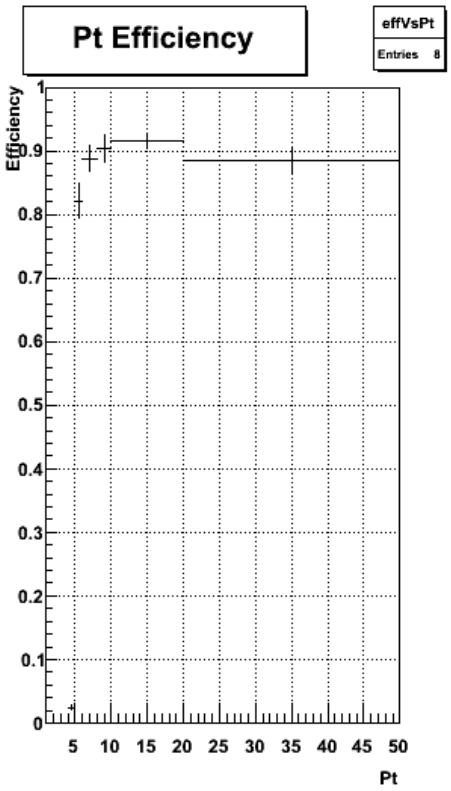
Efficiency for the probe to pass HLT_Mu3

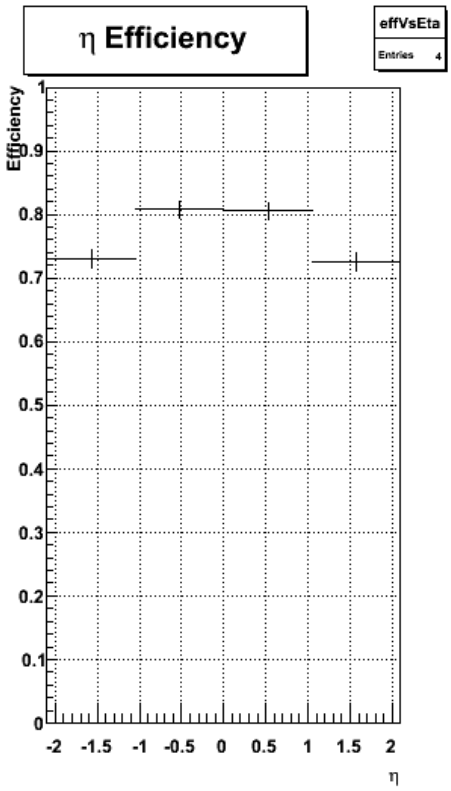


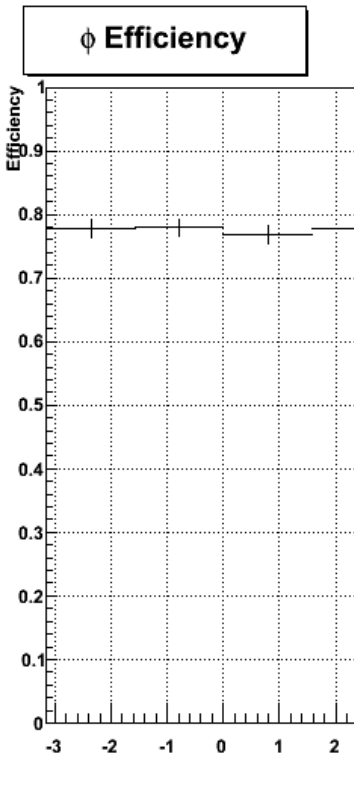
Upsilon

Upsilon: 330 relval

Efficiency for the probe to pass HLT_Mu5.



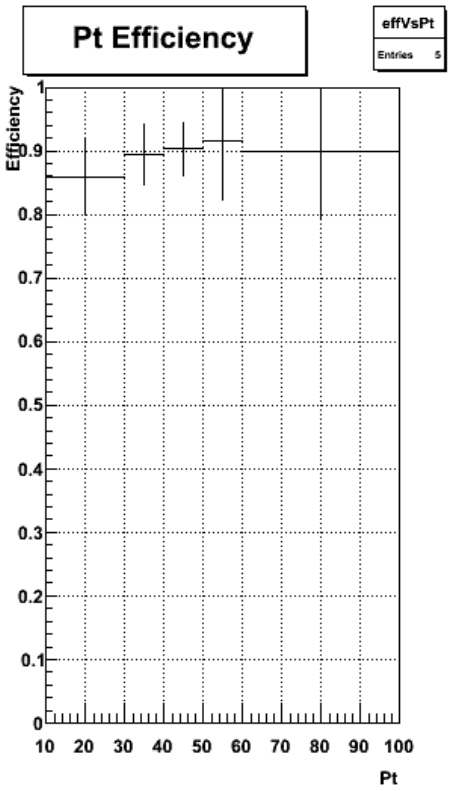


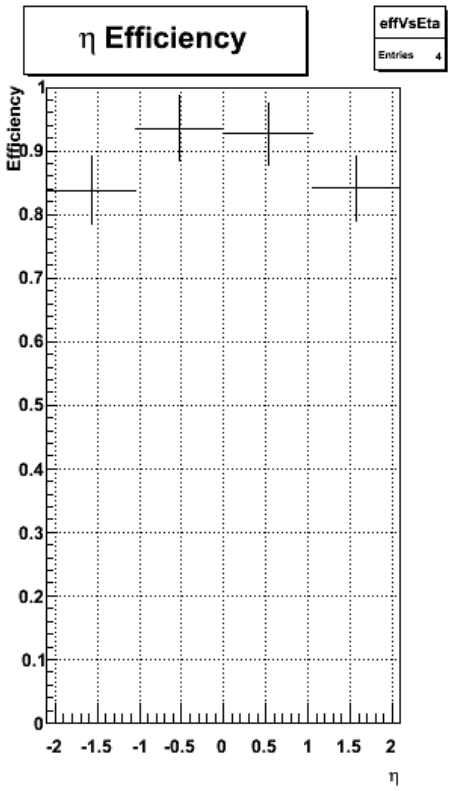


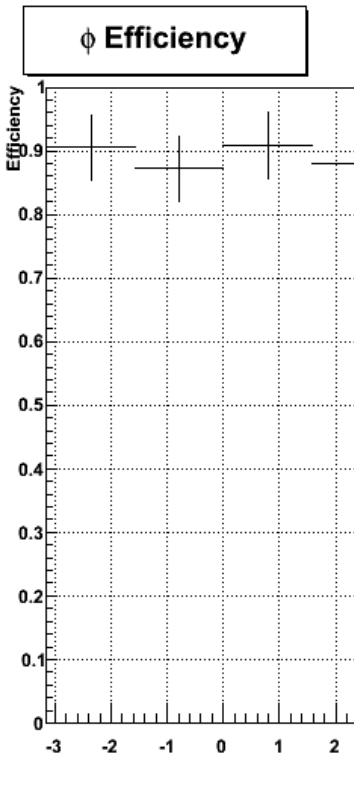
Z

Z Mu Mu: 340_pre2 relval (partial sample)

Efficiency for the probe to pass HLT_Mu5


Pt Efficiency
effVsPt
Entries 5
Efficiency
Pt


η Efficiency
effVsEta
Entries 4
Efficiency
η


ϕ Efficiency
Efficiency

Where is the code?

- BPAGTrigAnalyzer.cc
- DQMGenericTnPClient

-- JasonSlaunwhite - 2009-08-31

This topic: CMSPublic > SWGuideMuonHLTBPAGDQM
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