

ZCounting Meeting

19/01/2018

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[DQTGlobalWZFinderTool.cxx] Selection

"Good Muon" Selection

m_muonSelectionTool->accept() == true
from "CP::MuonSelectionTool/MuonSelectionTool"

$$p_T > 25 \text{ GeV}$$

m_isolationSelectionTool->accept() == true
from
"CP::IsolationSelectionTool/IsolationSelectionTool"

$$|d_0| < 3$$

Good Vertex: pVtx == true

$$|z_0 \sin(\theta)| < 0.5 \text{ mm}$$

Z Selection

Number of Muons > 1

trigChainsArePassed(m_Z_mm_trigger) == true

Leading+Subleading Mass: $66 \text{ GeV} < M < 116 \text{ GeV}$

[dqt_zlumi_alleff_HIST.py]

Trigger Efficiency

$$A = N_{1\mu} = 2N\varepsilon_t(1 - \varepsilon_t)$$

$$B = N_{2\mu} = N\varepsilon_t^2$$

$$\varepsilon_t = \frac{1}{\frac{A}{2B} + 1}$$

$$\sigma_{\varepsilon_t} = \varepsilon_t^2 \sqrt{\left(\frac{\sigma_A}{2B}\right)^2 + \left(\frac{A\sigma_B}{2B^2}\right)^2}$$

Calculations Fine. (No AB Correlation term in Error, is valid?)

[dqt_zlumi_alleff_HIST.py]

Reconstruction Efficiency

$$A = N_{match,OS} - N_{match,SS}$$

$$B = N_{nomatch,OS} - N_{nomatch,SS}$$

$$\varepsilon_r = \frac{1}{1 + \frac{B}{A}}$$

$$\sigma_{\varepsilon_t} = \varepsilon_t^2 \sqrt{\left(\frac{B\sigma_A}{A^2}\right)^2 + \left(\frac{\sigma_B}{A}\right)^2}$$

Calculations Fine. (No AB Correlation term in Error, is valid?)

[dqt_zlumi_alleff_HIST.py]

All Efficiency

$$\varepsilon = [\varepsilon_r^2][1 - (1 - \varepsilon_t)^2]$$

One for each Muon

Accounts for both 1 muon
triggering OR 2 muon triggering

$$\sigma_\varepsilon = \sqrt{\left(2\varepsilon_r^2(1 - \varepsilon_t)\sigma_{\varepsilon_t}\right)^2 + \left(2\varepsilon_r(1 - (1 - \varepsilon_t)^2)\sigma_{\varepsilon_r}\right)^2}$$

Calculations Fine. (No $\varepsilon_r\varepsilon_t$ Correlation term in Error, is valid?)

[dqt_zlumi_combine_lumi.py]

ZRate

Calculates Z Rate before calculating Luminosity

$$Z_{rate} = \frac{N}{\epsilon t}$$

Lifetime

$$\sigma_t \approx 0$$

Correct Calculation:

$$\sigma_{Z_{rate}} = \frac{1}{t} \sqrt{\left(\frac{\sigma_N^2}{\epsilon^2}\right) + \left(\frac{N\sigma_\epsilon}{\epsilon^2}\right)^2}$$

Calculation in Code:

$$\sigma_{Z_{rate}} = \frac{1}{t} \sqrt{\left(\frac{\sigma_N^2}{\epsilon}\right) + \left(\frac{N\sigma_\epsilon}{\epsilon^2}\right)^2}$$

Line 112 may be a mistake but second term significantly swamps error calculation anyway, no noticeable effect.

(No $N\epsilon$ Correlation term in Error, probably not valid?)

[dqt_zlumi_combine_lumi.py]

ZLumi

Just scales Z rate by factors to get Lumi

$$L = \frac{Z_{purity}}{A[\sigma_{Z \rightarrow \mu\mu}]} * Z_{rate}$$

$$\sigma_L = \frac{Z_{purity}}{A[\sigma_{Z \rightarrow \mu\mu}]} * \sigma_{Z_{rate}}$$

Sigma here is Cross-Section

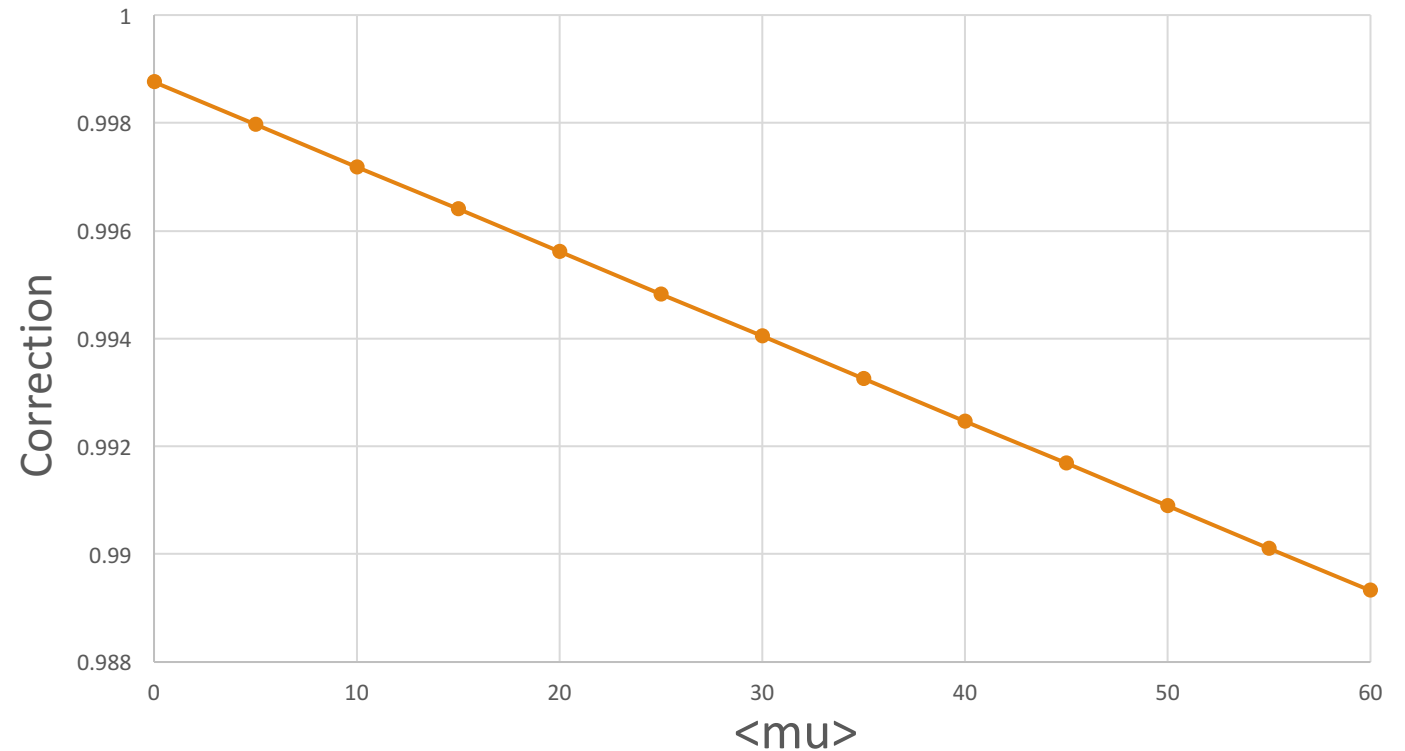
Acceptance

[dqt_zlumi_combine_lumi.py]

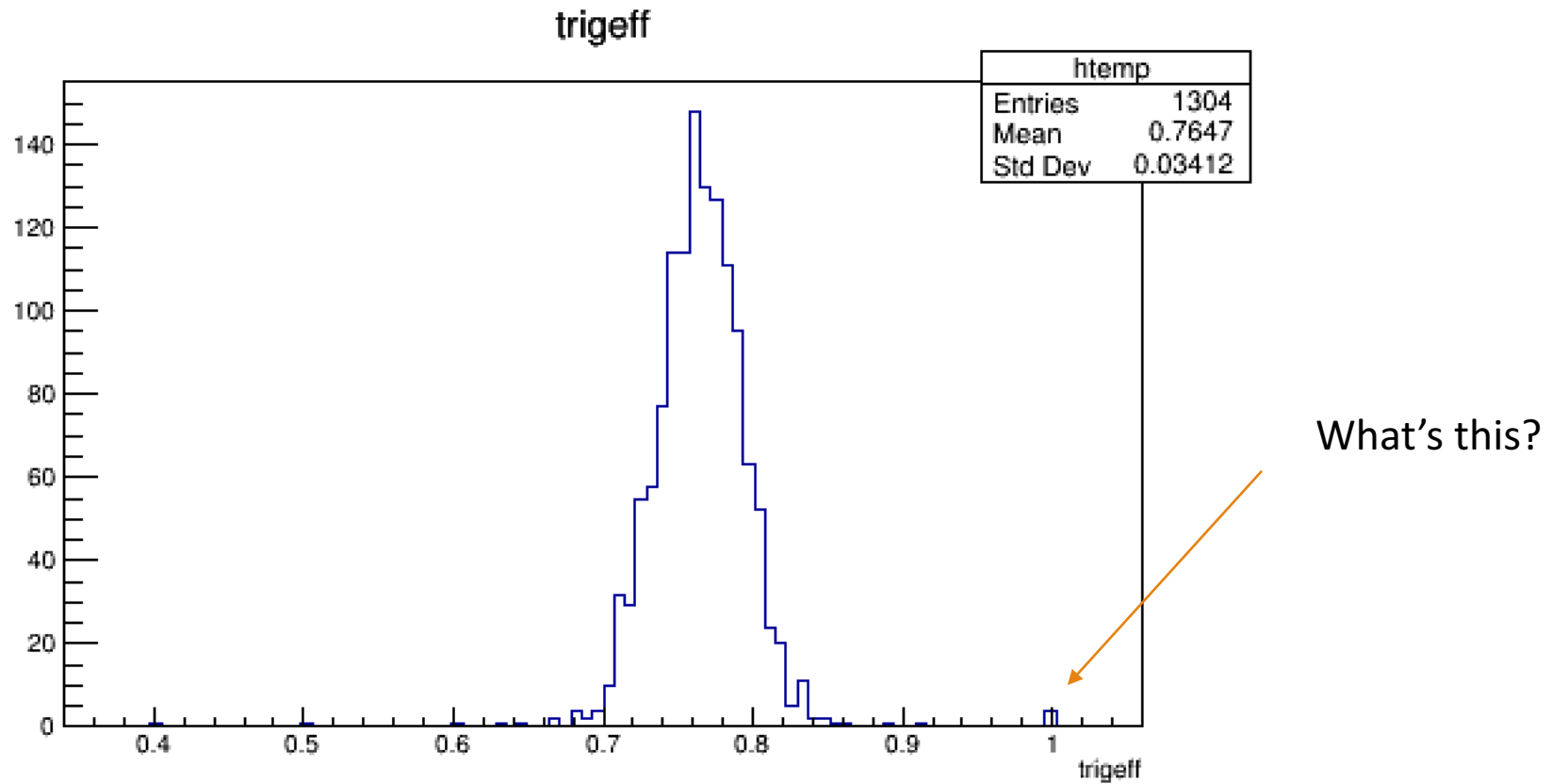
$\langle \mu \rangle$ Corrections

Applied to Efficiency when evaluating total efficiency over number of Lumi Blocks.
Seems relatively minor, what is it correcting?

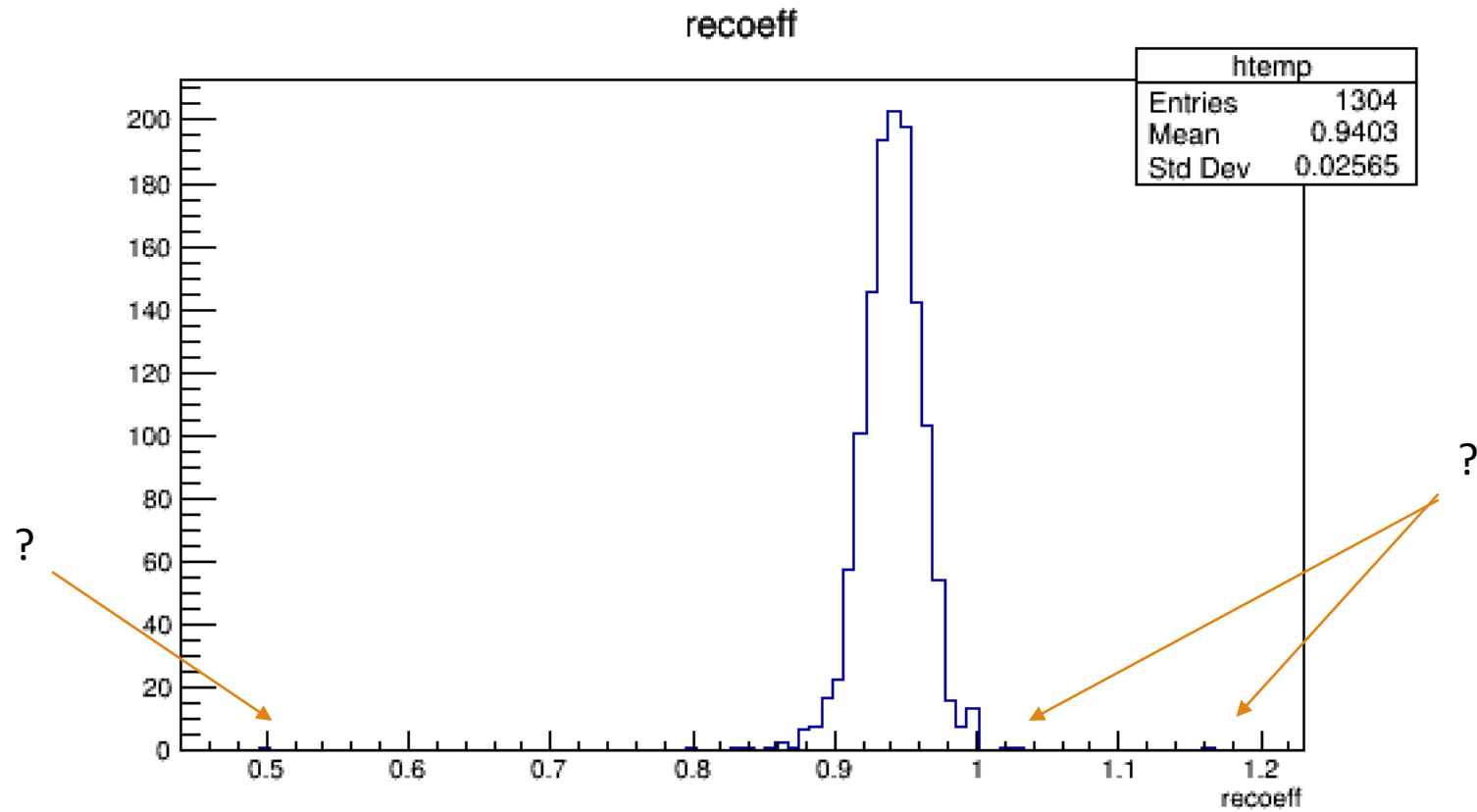
```
def correction(mu):  
    # R20.7  
    # return 1.04524-0.000108956*mu  
    # R21  
    #return 1.04701-0.000206159*mu  
    return 0.998758-0.000157214*mu  
    #return 1.
```



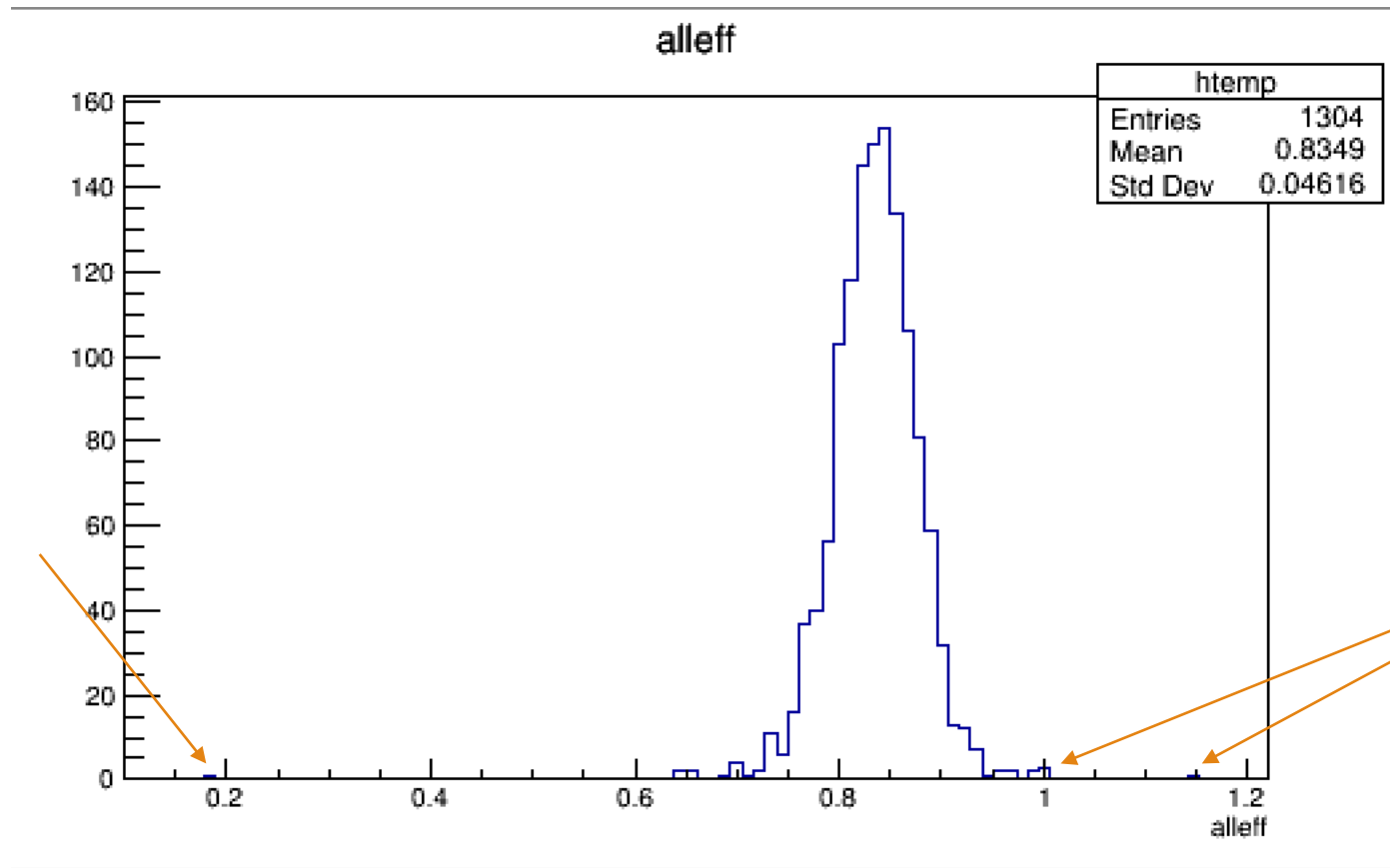
Trig. Eff Distribution [2016 Run304008]



Reco. Eff Distribution [2016 Run304008]



All Eff. Distribution [2016 Run304008]



Notes

#ACCEPTANCE = 3.173927e-01
ACCEPTANCE = 3.323224e-01

Ratio ≈ 1.05 , roughly our deviation from “official” luminosity. Why did they change it?

[data16_13TeV:data16_13TeV.00310574.physics_Main.merge.AOD.f756_m1704](#)

This wont process for me on the grid using either Michaels submission script or my own. Is it just me?