



QmisID estimation studying for 2LSS analysis Shuiting Xin

Introduction

• Final states: 2 same signed lepton, one of them is charge mis-identified

Muon QmisID rates <10^-5, only consider electron

• Two contributions :

Hard bremsstratrung process , |eta|

Mismeasurement of the electron track-curvature , |pt|

• Stratagy: derived from Z->ee data based on MLE

$$\epsilon_i(1-\epsilon_j)+\epsilon_j(1-\epsilon_i)=\epsilon_i+\epsilon_j-2\epsilon_i\epsilon_j$$

Likelihood method

$$\ln L(arepsilon|N_{SS},N) = \sum_{i,j} \lnig[N^{ij}(arepsilon_i+arepsilon_j-2arepsilon_iarepsilon_j)ig]N^{ij}_{SS} - N^{ij}(arepsilon_i+arepsilon_j-2arepsilon_iarepsilon_j)$$

number of QmisID for ee and eu channel

$$\overline{N}_{\text{SS}} = \frac{\epsilon_i + \epsilon_j - 2\epsilon_i \epsilon_j}{1 - (\epsilon_i + \epsilon_j - 2\epsilon_i \epsilon_j)} N_{\text{OS}} \quad \text{and} \quad \overline{N}_{\text{SS}} = \frac{\epsilon_i}{1 - \epsilon_i} N_{\text{OS}}$$
Expected Observed

- dataset:15+16+17, 80fb-1
- MC samples: Z->ee(SHERPA)
- Variable "ElectronsCase" are used:

both electrons are tight
 both electrons are anti-tight
 one tight and one anti-tight
 at least one tight

- Selection: all go though LOOSE
 - Jet number >=1: nJets_OR_T>=1
 - Bjet veto: nJets_OR_T_MV2c10_70==0
 - Lepton pt>=10GeV
 - Only ee
- Bin set
 - eta [0.,0.60,1.1,1.37,1.52,1.70,2.00,2.47]
 - Pt [10, 60, 90, 130, 1000]GeV

Comparison of the mee distribution between same-sign and opposite-sign data events



Z-window($\pm 4\sigma$) and sideband Boundaries

SS: 53.2621,74.353,106.655,124.453 OS 61.3656,75.8701,104.879,119.384

QMisID rates as a function of |eta| and p_t

going though selection ElectronCase 4

Tight

anti-tight



truth-closure test

tight electron



- derived from simulated Z+jets events and compared to the rates based on truth-matching
- likelihood rates is much higher than truth-matching !
- After changing different cut it gets worse

Charge Dependence

Add lep_ID==-11 to Tight requirement, lep_ID==11 to Anti-tight requirment

run on data

Postron



Charge Dependence

run on sample

Postron



electron



Conclusion

- Obtained QmisID rates from data, quiet close to the result with note ATL-COM-PHYS-2018-410
- huge disagreement between truth-matching and MLE, try to find answer