Zgamma Xsection measurement:
D0 method tried in ATLAS
inclusive test

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Cross-section measurement

$$N_{sig} - N_{bgd} = \varepsilon_{ll\gamma} \sigma \int L dt$$

Nsig is what we observed in data

The key point is to figure out Nbgd

- Method Inclusive Test

samples

- Zgamma: 005899 Z to e, μ, τ 98.5K
- Zjet: 006904 Z to ee 123.3K
- 006905 Z to μ μ

Selection cuts

- **e:**
- pt>20GeV
- $|\eta|$<2.5
- author=1 ||3
- Isolation: Etcone20<6GeV
- isEM : Medium

Selection cuts

- μ :
-   Pt>20GeV,
-   |η|<2.5
-   author=1
-   Isolation: Etcone20<6*GeV
-   x2/ndof < 4

Selection cuts

- γ
- Pt>10GeV,
- $|\eta|$<3
- Isolation: Etcone20<6*GeV
- No track match
- isEM: & 0x3FFF ==0
- llr>0
- Number of track in 0.3 cone < 2

Event selection

- Exactly 2e or 2μ with opposite charge
- Exactly 1 γ
- ETMiss<20GeV
- 50GeV<MZ<130GeV
- dR(l$\pm$, γ)>0.7

Selection results

Cut flow

Cut	X-section	Exactly 2e or 2μ (+,-)	Exactly 1 gamma	E_TMiss<20 GeV	dR($l^{\pm}, \gamma$) >0.7	50GeV<M_Z <130GeV	Normalized to 1 fb^{-1}
Z(e,μ,τ)+γ (98500)	15.94pb	18973	9354	8478	7681	7392	1196
Z(ee)jet (123250)	140.6pb	33837	285	189	124	106	121
Z(μμ)jet (123750)	140.6pb	45390	349	289	175	152	173

Inclusive test

- Re:14.1.0
- Sample : Zjet: 006904 Z to ee
- 123.3K
- The first step is to get fake rate

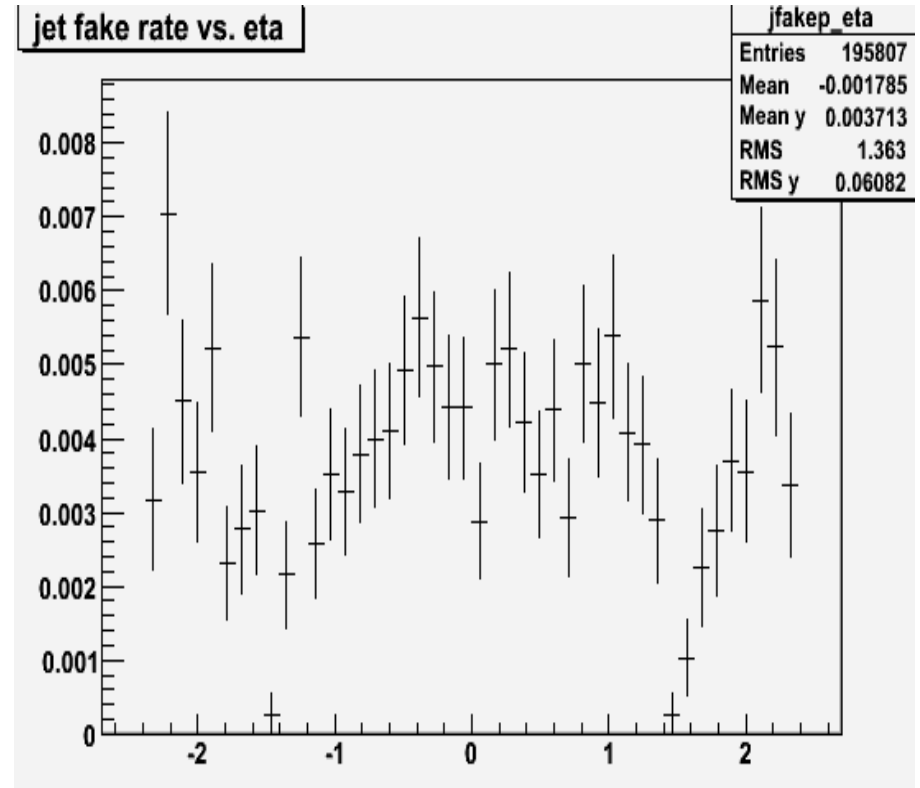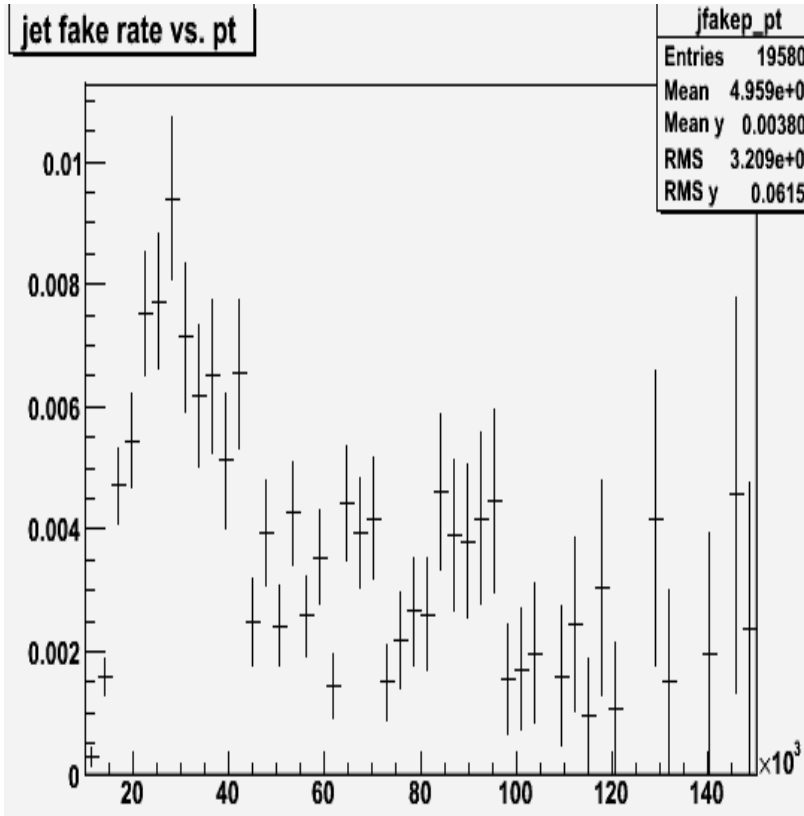# Fake rate
Using MC truth information:

Jet Selection:

1. Get MC jet with dR(mcjet,mcelectron)>0.1;

2. For such a MC jet, find the corresponding recon jet by dR(mcj,rej)<0.2 and 0.5<dpt<1.5. (if more than 1 reco jet find, get the one with closest pt)

3. For the chosen reco jet, try to find a photon(pass photon ID, and not fake from e) with dR(recj,photon)<0.2
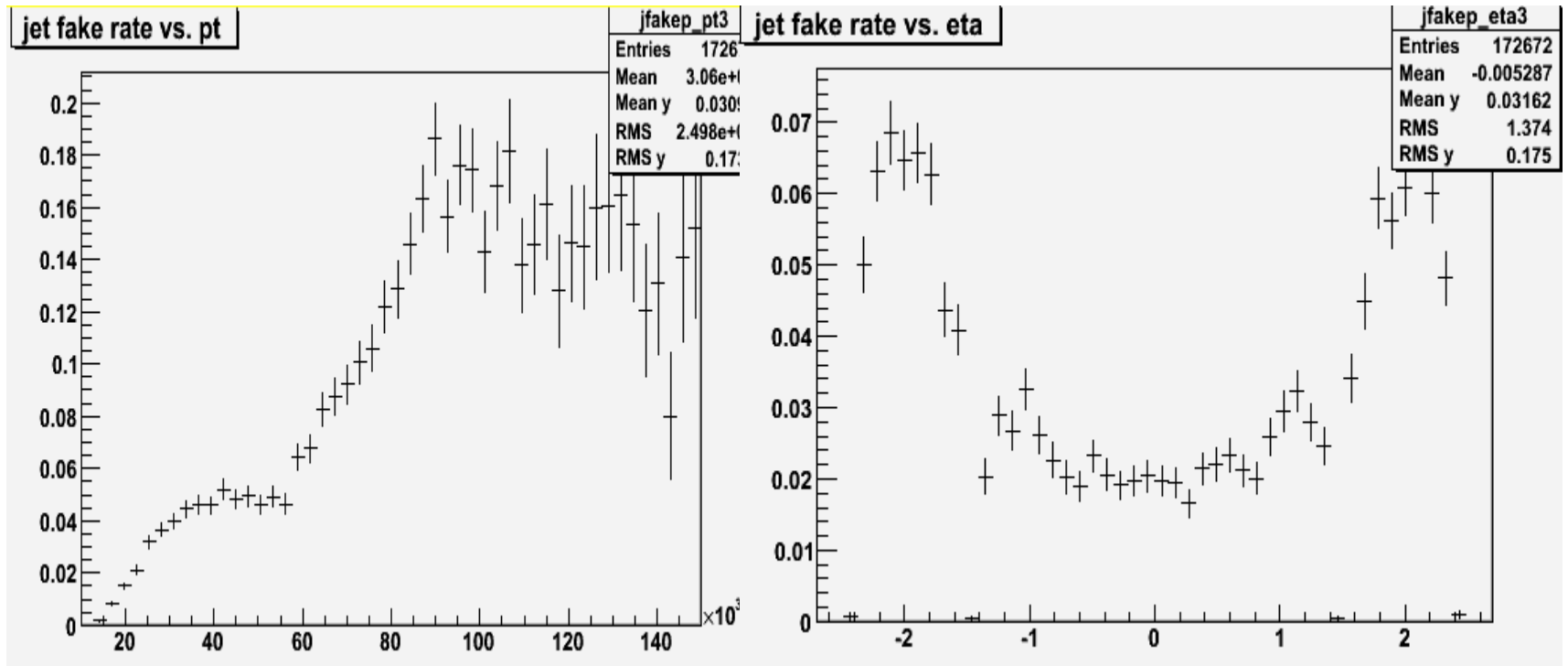
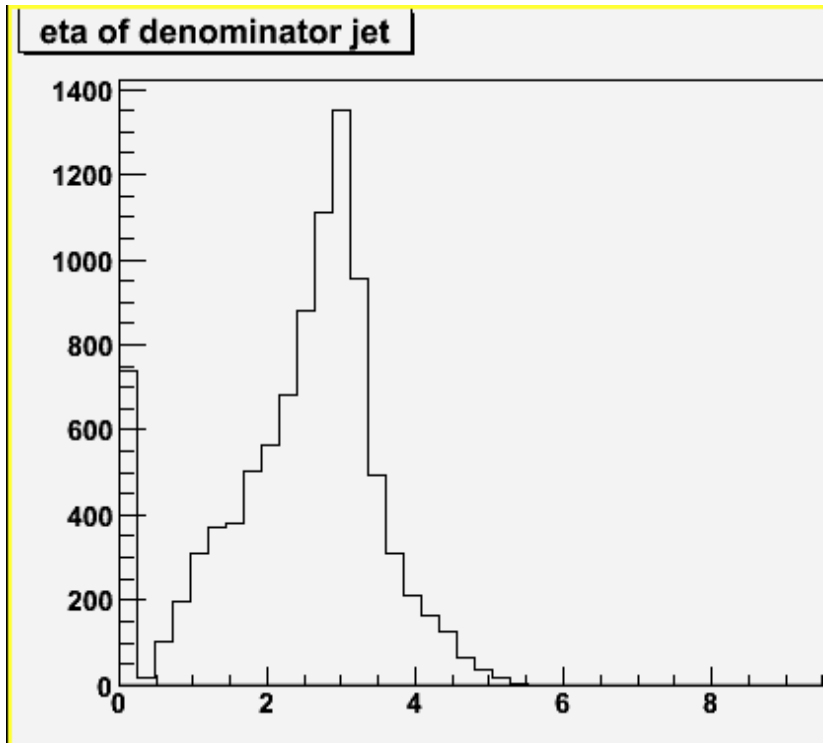4. Fill the ratio as fake rate

Fake rate

Fake rate
without MC truth information:

Jet Selection:

- 1. For a reco jet, match with all electron candidate, keep these with dR(rej,ele)>0.7

  2 .For the chosen reco jet, try to find a photon(pass photon ID, and not fake from e) with dR(recj,photon)<0.2

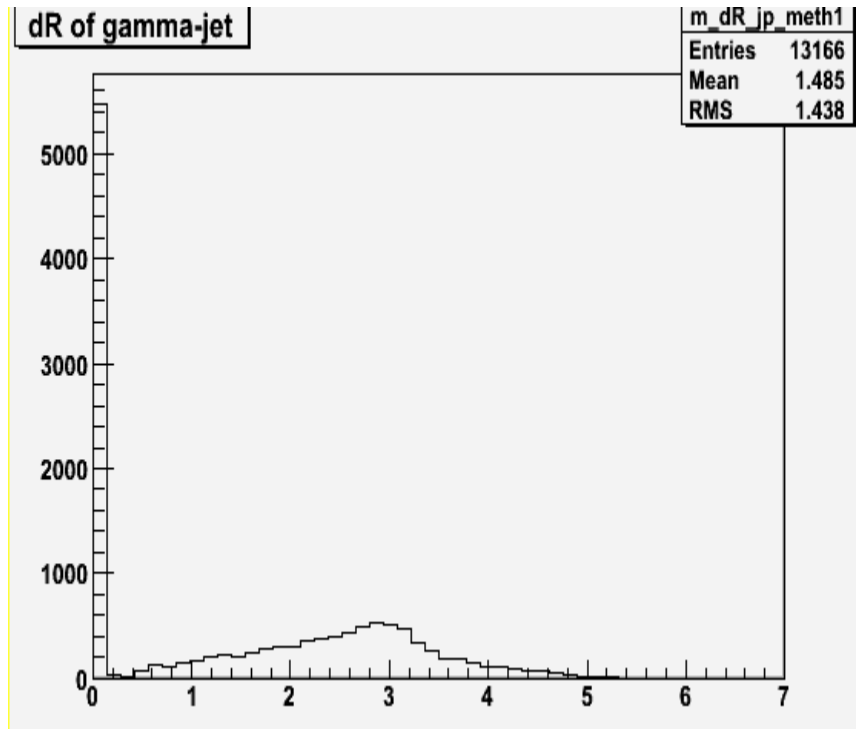- 3. Fill the ratio as fake rate

Fake rate

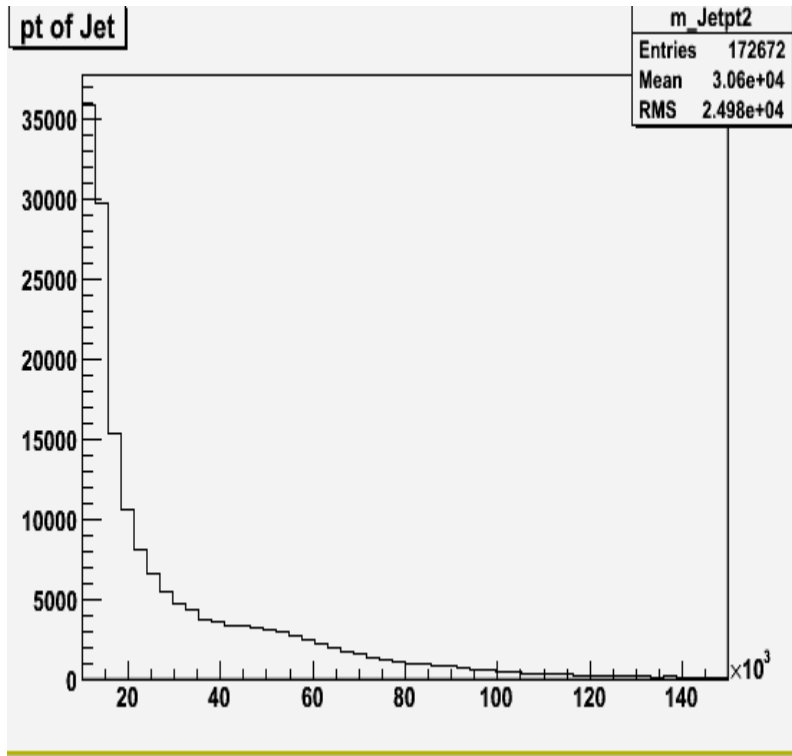# Why so different?
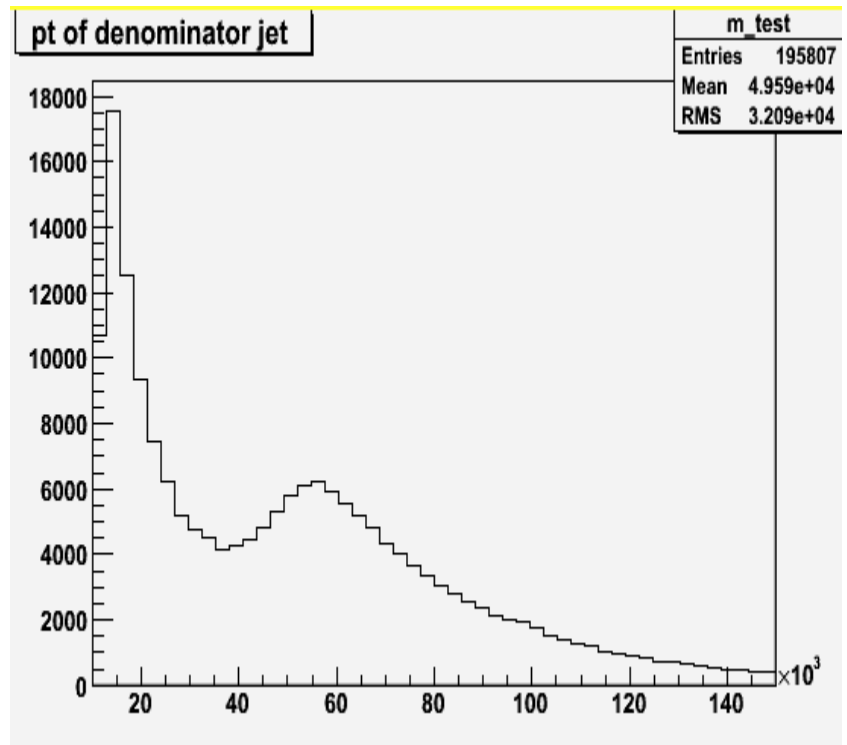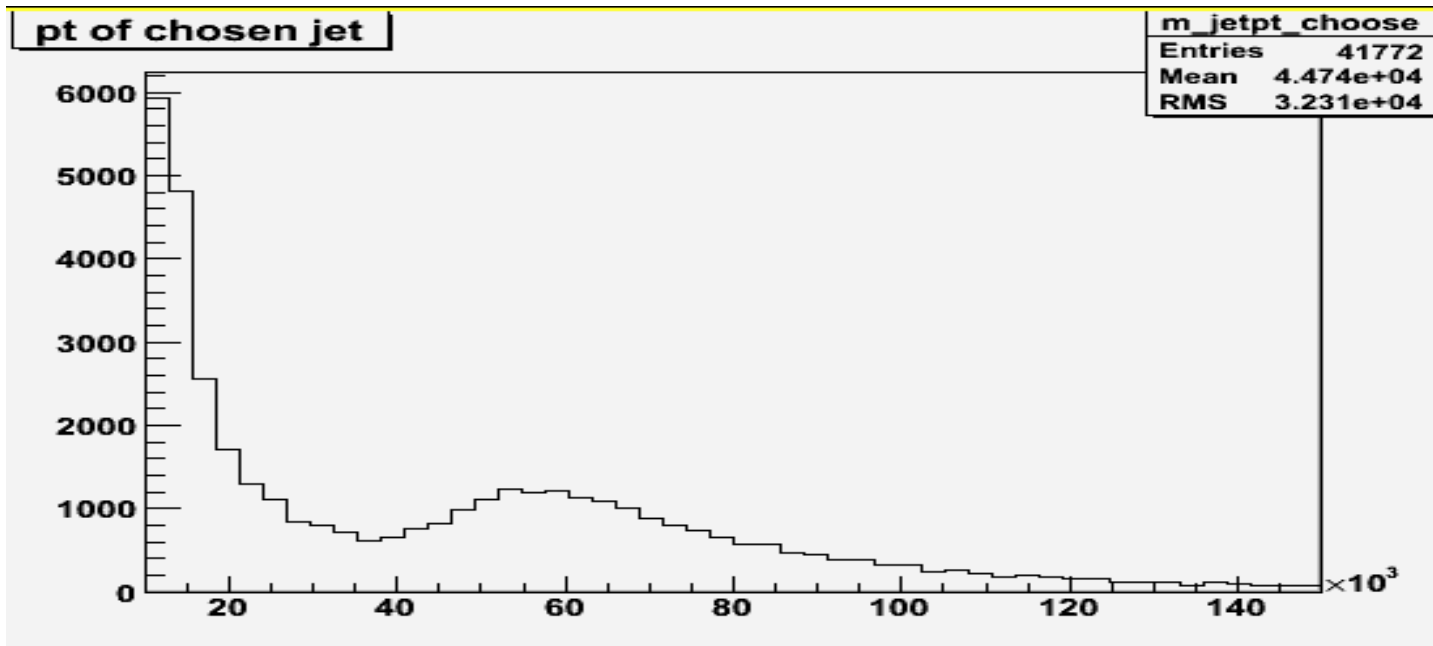

Method 1

method2

method2   method1

Inclusive test

- Event have Z
- Jet pt>10GeV, |eta|<2.5
- dR(jet,e+-)>0.7

Inclusive test

- Result:
- 135+- 29