Study of Jet ΔE_T vs PU

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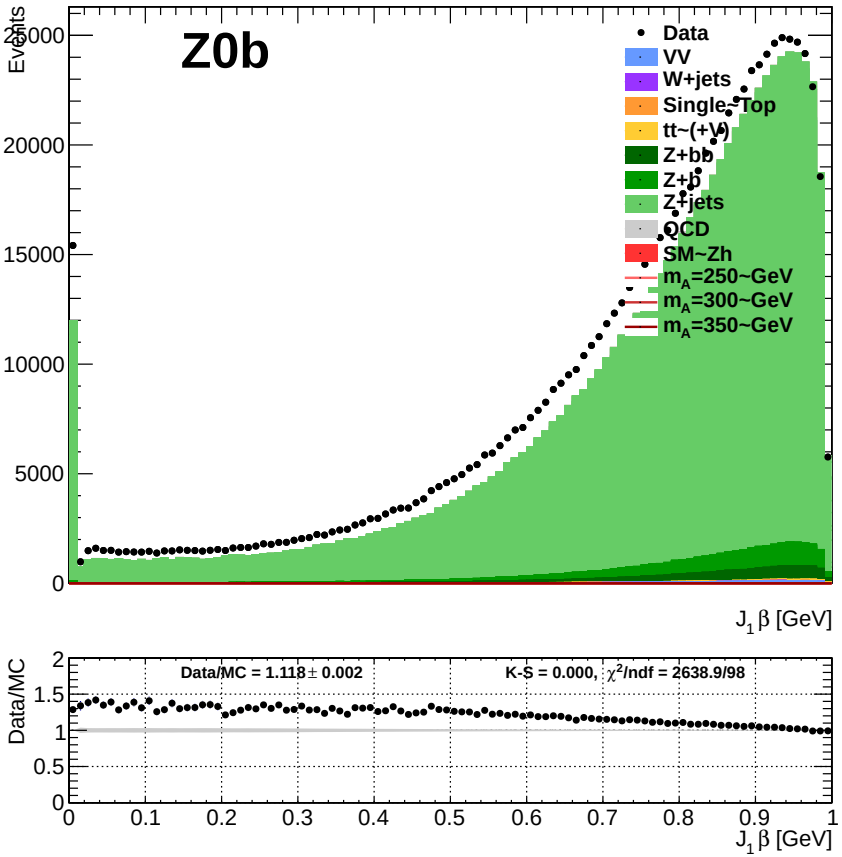
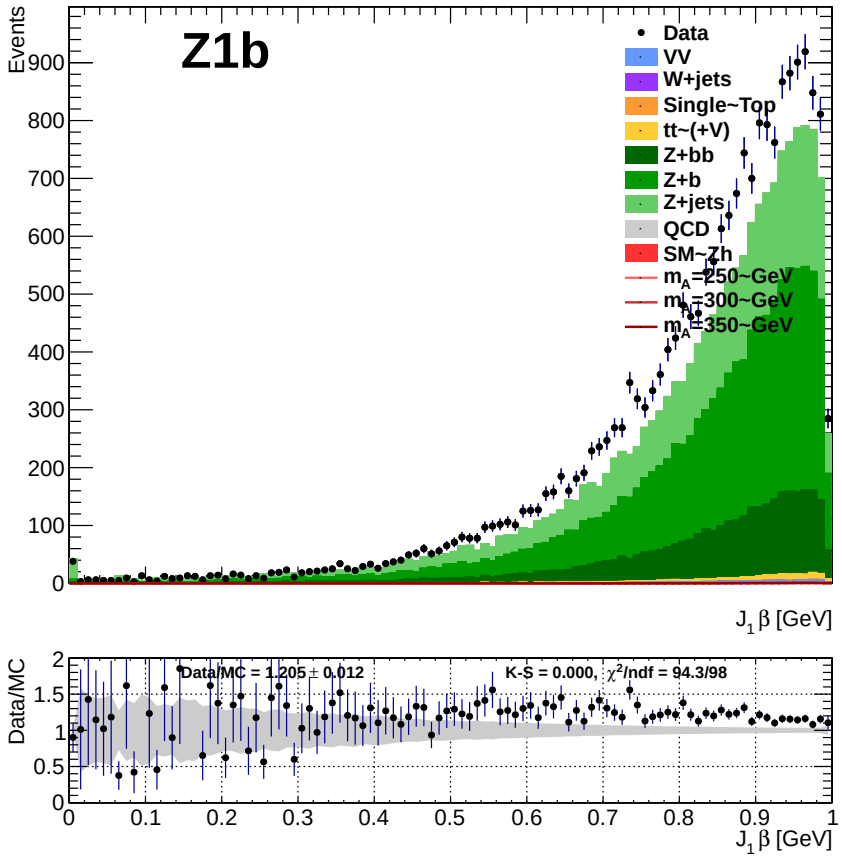
Intro

What it is about:

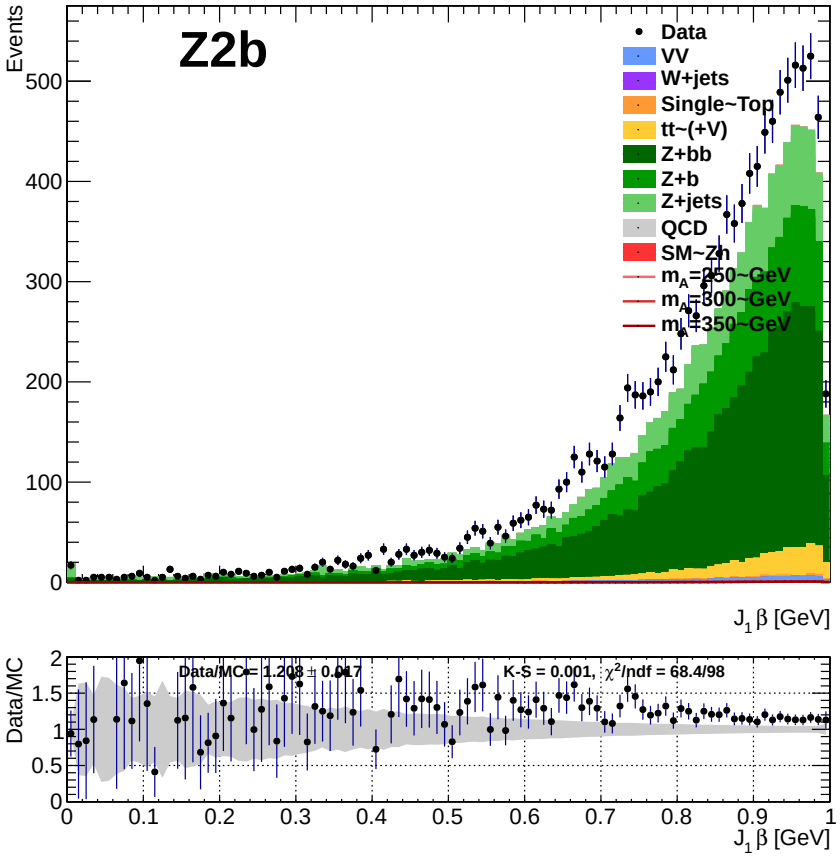
- New variables are availables for jets, sensitive to PU contamination:
  - β, β^*, and a mulivariate discriminator `mvaId`
- Comparing Data-MC distribution for this variables
  - In all 4 Control Region
  - DO not look at normalization!
- Check is they have some correlation with Jet scale and resolution:
  - Plot $\Delta E_T = E_T^{reco} - E_T^{genJet}$ vs β, β^*, and `mvaId`;
  - include only Jets where a `GenJet` is associated;

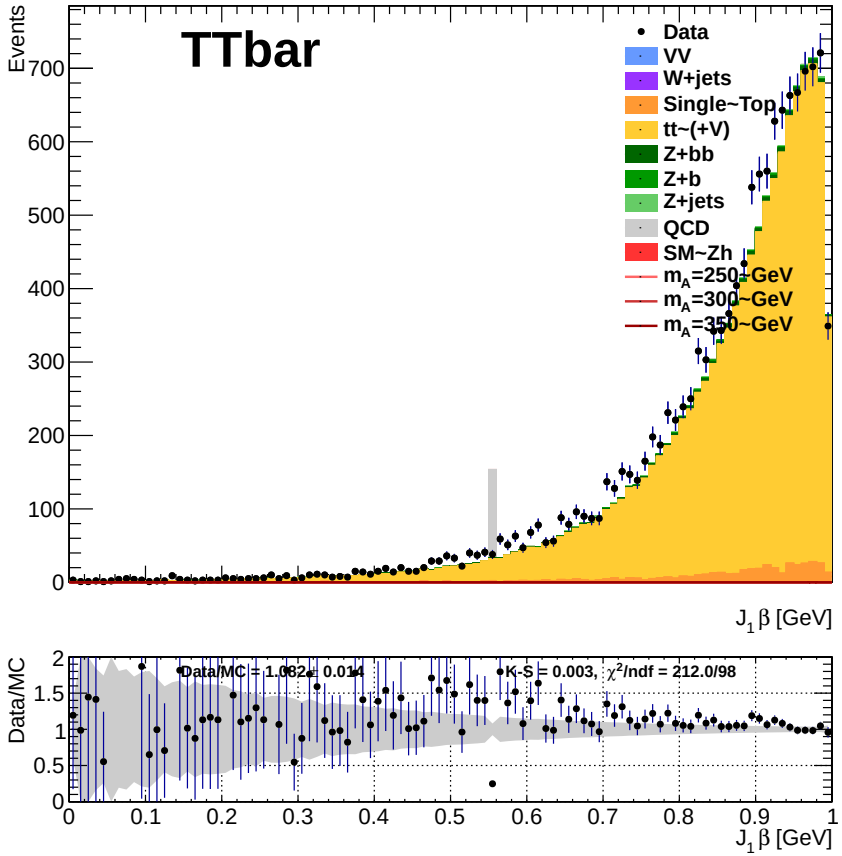
β (I)


Z0b
Data
VV
W+jets
Single~Top
tt~(+V)
Z+bb
Z+b
Z+jets
QCD
SM~Zh
m_A=250~GeV
m_A=300~GeV
m_A=350~GeV
Events
J_1 β [GeV]
Data/MC = 1.118 ± 0.002
K-S = 0.000, χ²/ndf = 2638.9/98
Data/MC

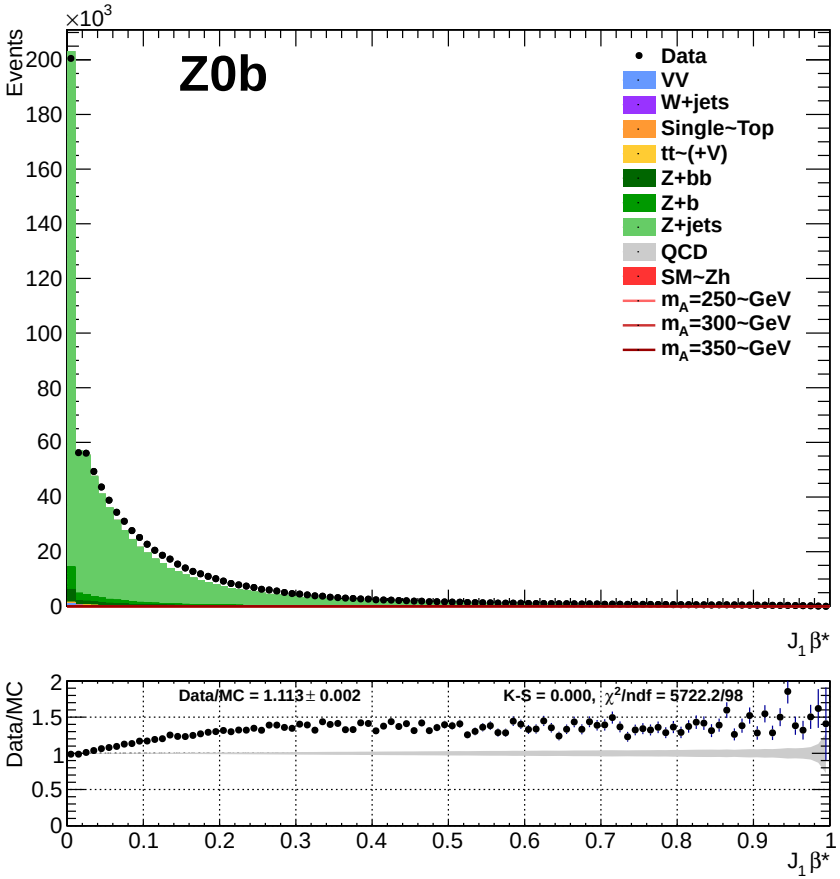

Z1b
Data
VV
W+jets
Single~Top
tt~(+V)
Z+bb
Z+b
Z+jets
QCD
SM~Zh
m_A=250~GeV
m_A=300~GeV
m_A=350~GeV
Events
J_1 β [GeV]
Data/MC = 1.205 ± 0.012
K-S = 0.000, χ²/ndf = 94.3/98
Data/MC

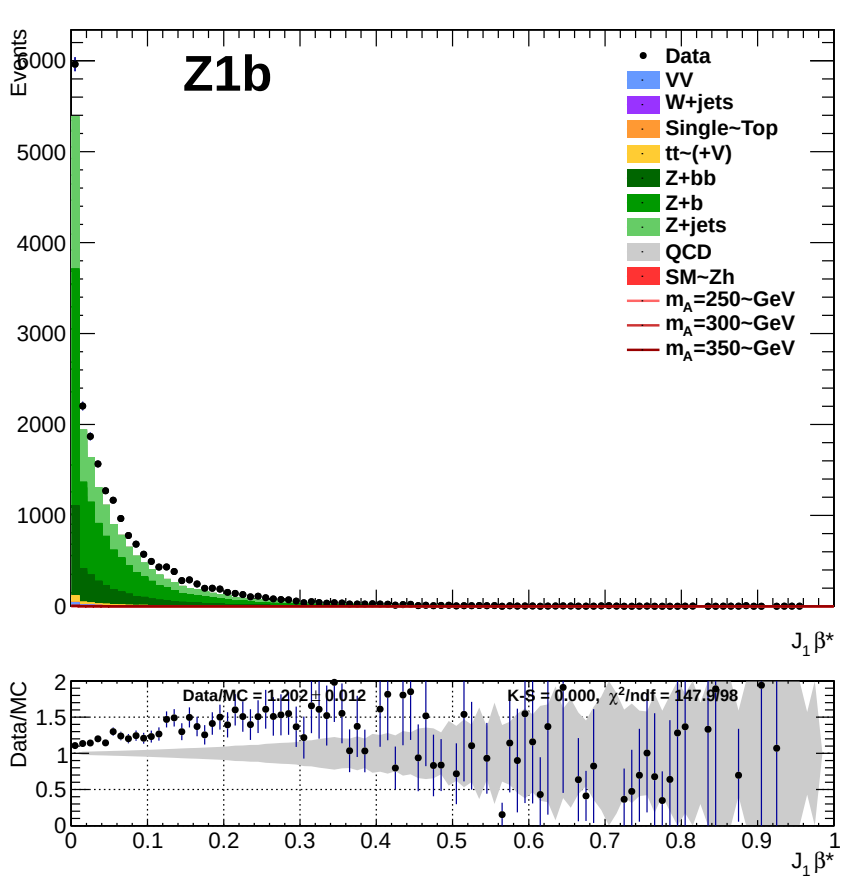
β (II)


Z2b
Data
VV
W+jets
Single~Top
tt~(+V)
Z+bb
Z+b
Z+jets
QCD
SM~Zh
m_A=250~GeV
m_A=300~GeV
m_A=350~GeV
Events
J_1 β [GeV]
Data/MC
Data/MC = 1.203 ± 0.017
K-S = 0.001, χ²/ndf = 68.4/98

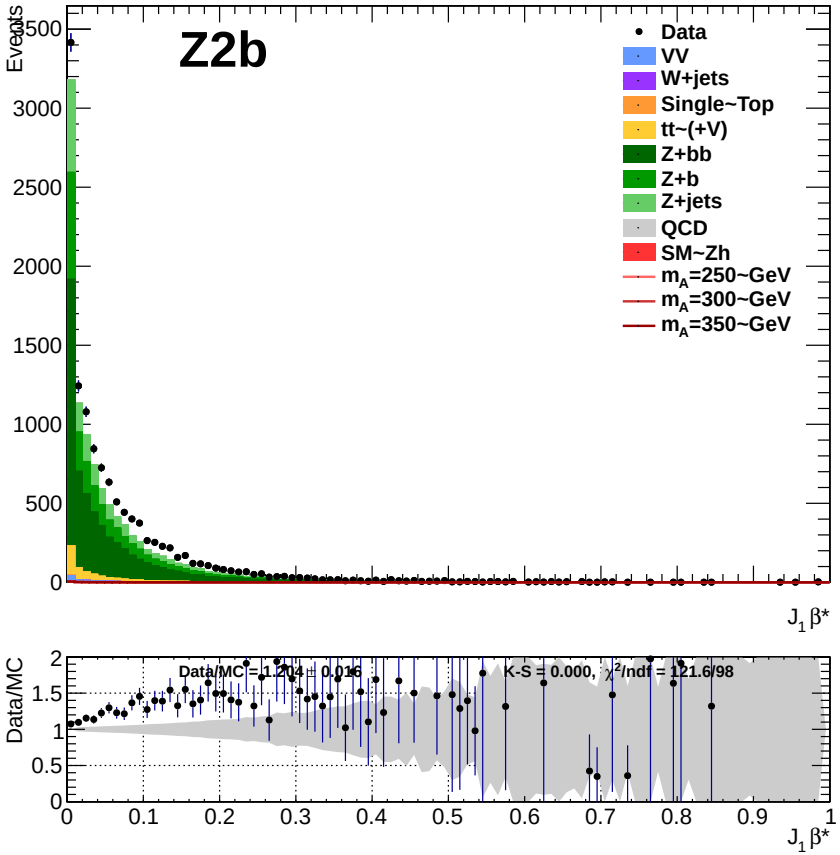

TTbar
Data
VV
W+jets
Single~Top
tt~(+V)
Z+bb
Z+b
Z+jets
QCD
SM~Zh
m_A=250~GeV
m_A=300~GeV
m_A=350~GeV
Events
J_1 β [GeV]
Data/MC
Data/MC = 1.082 ± 0.014
K-S = 0.003, χ²/ndf = 212.0/98

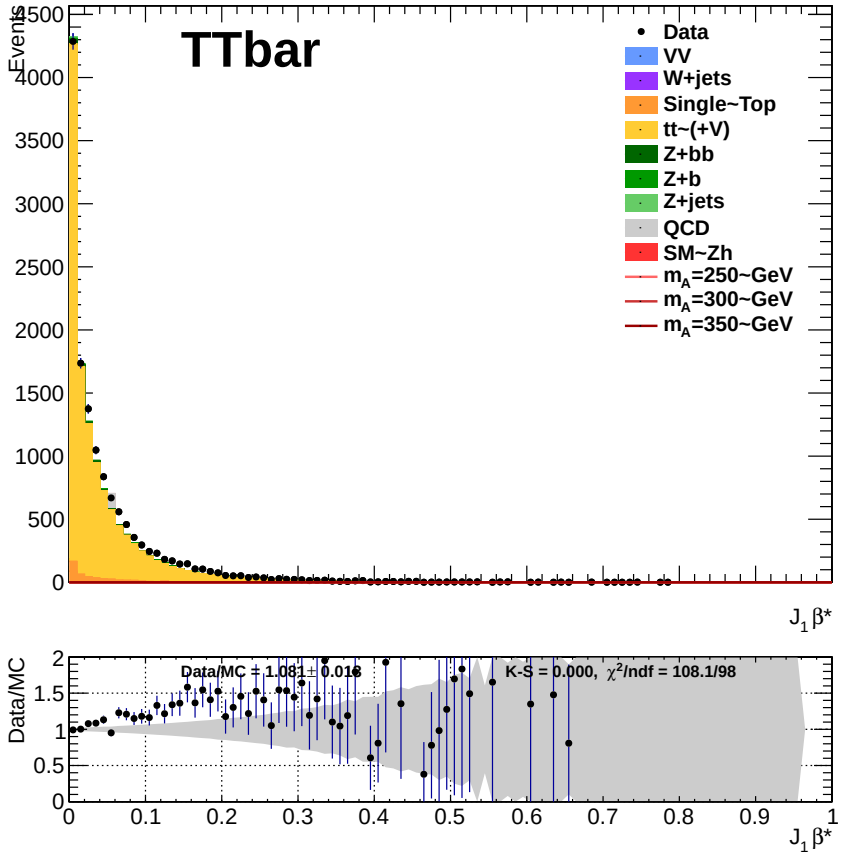
β^* (I)


Z0b
Data
VV
W+jets
Single~Top
tt~(+V)
Z+bb
Z+b
Z+jets
QCD
SM~Zh
m_A=250~GeV
m_A=300~GeV
m_A=350~GeV
Events
×10^3
J_1 β*
Data/MC
Data/MC = 1.113 ± 0.002
K-S = 0.000, χ²/ndf = 5722.2/98

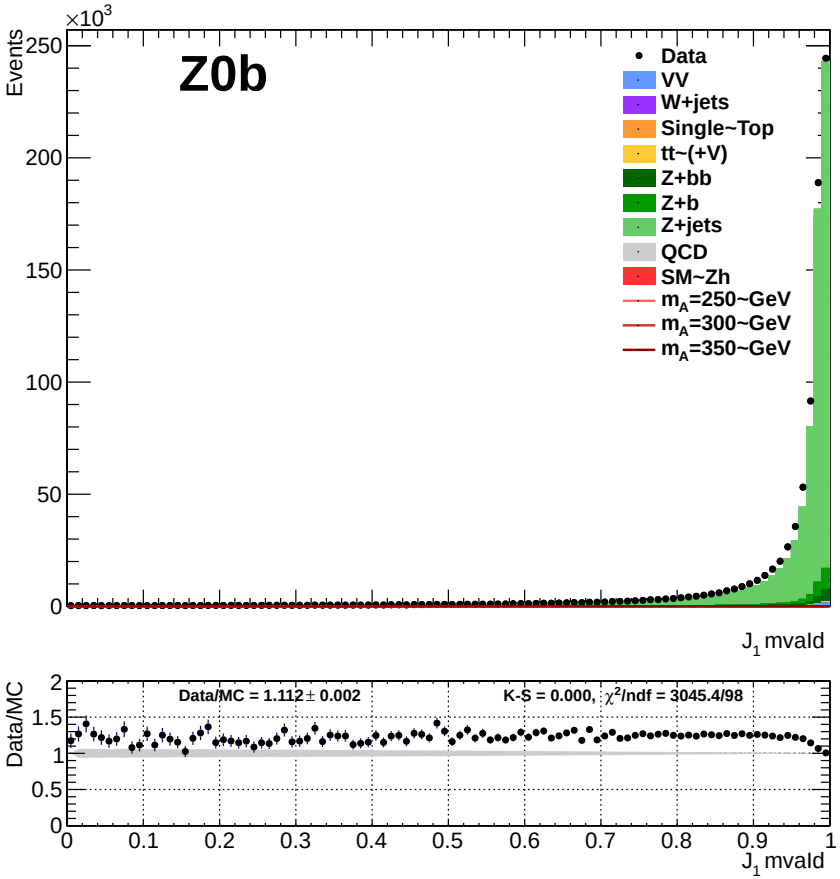

Z1b
Data
VV
W+jets
Single~Top
tt~(+V)
Z+bb
Z+b
Z+jets
QCD
SM~Zh
m_A=250~GeV
m_A=300~GeV
m_A=350~GeV
Events
J_1 β*
Data/MC
Data/MC = 1.202 ± 0.012
K-S = 0.000, χ²/ndf = 147.9/98

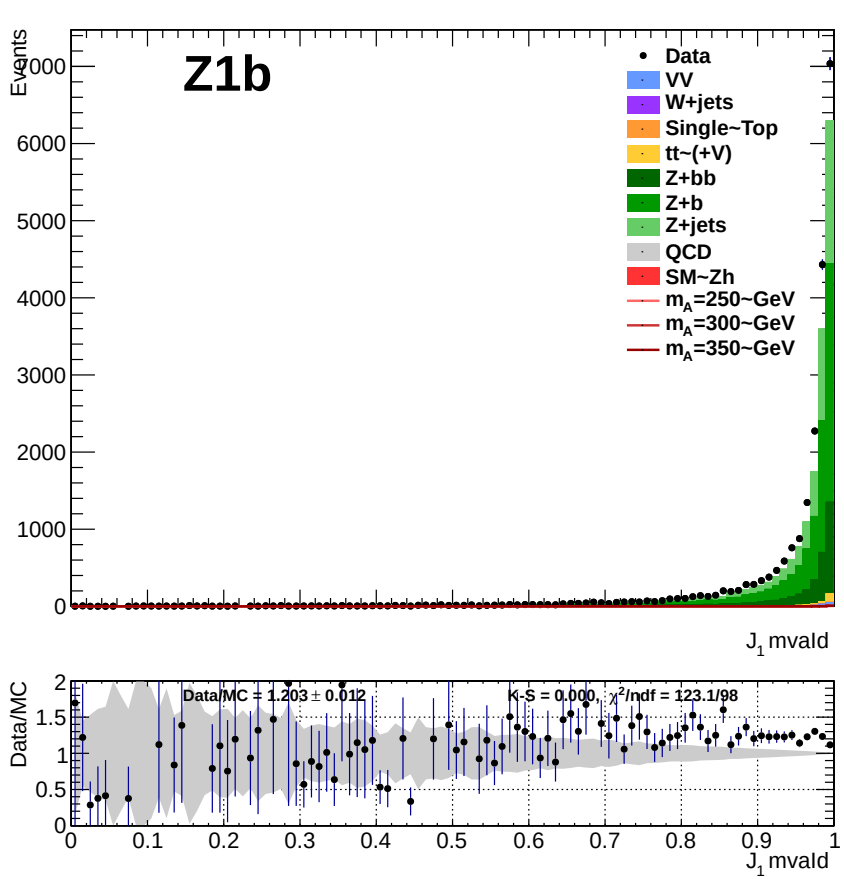
β^* (II)


Z2b
Data
VV
W+jets
Single~Top
tt~(+V)
Z+bb
Z+b
Z+jets
QCD
SM~Zh
m_A=250~GeV
m_A=300~GeV
m_A=350~GeV
Events
J_1 β*
Data/MC = 1.204 ± 0.016
K-S = 0.000, χ²/ndf = 121.6/98

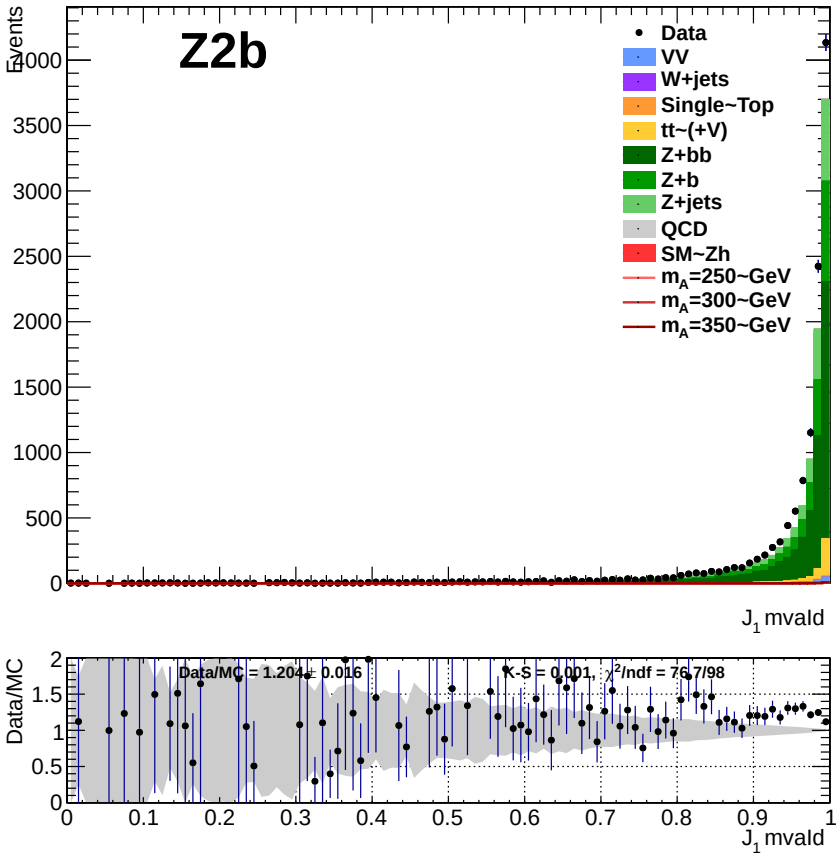

TTbar
Data
VV
W+jets
Single~Top
tt~(+V)
Z+bb
Z+b
Z+jets
QCD
SM~Zh
m_A=250~GeV
m_A=300~GeV
m_A=350~GeV
Events
J_1 β*
Data/MC = 1.081 ± 0.018
K-S = 0.000, χ²/ndf = 108.1/98

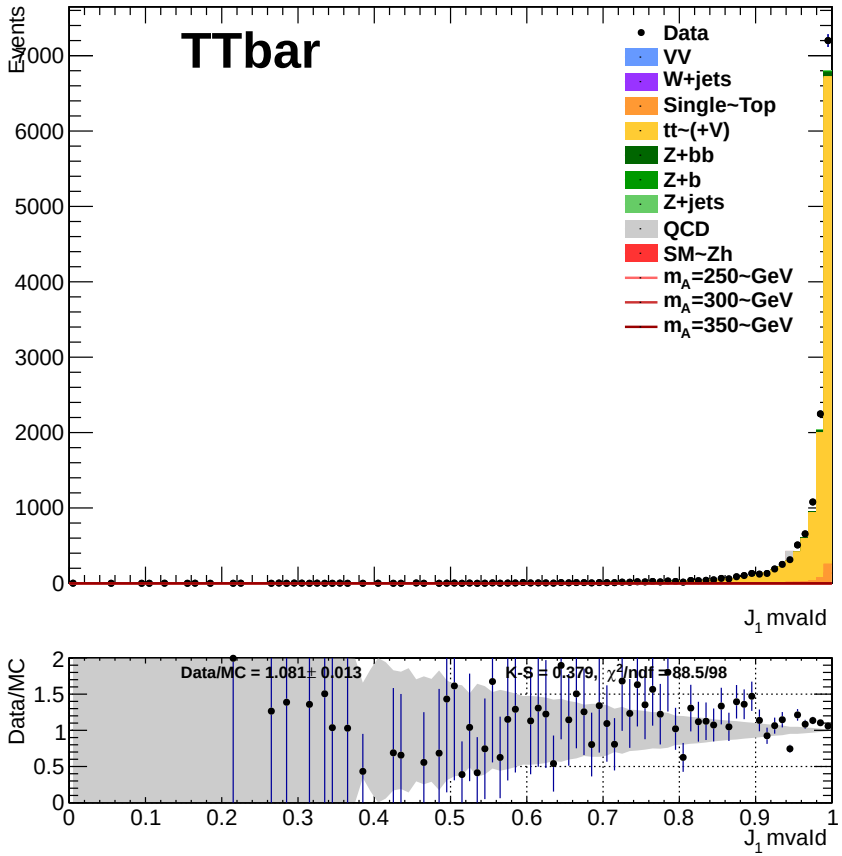
mvaId (I)


Z0b
Data
VV
W+jets
Single~Top
tt~(+V)
Z+bb
Z+b
Z+jets
QCD
SM~Zh
m_A=250~GeV
m_A=300~GeV
m_A=350~GeV
Events
×10^3
J_1 mvaId
Data/MC
Data/MC = 1.112 ± 0.002
K-S = 0.000, χ²/ndf = 3045.4/98

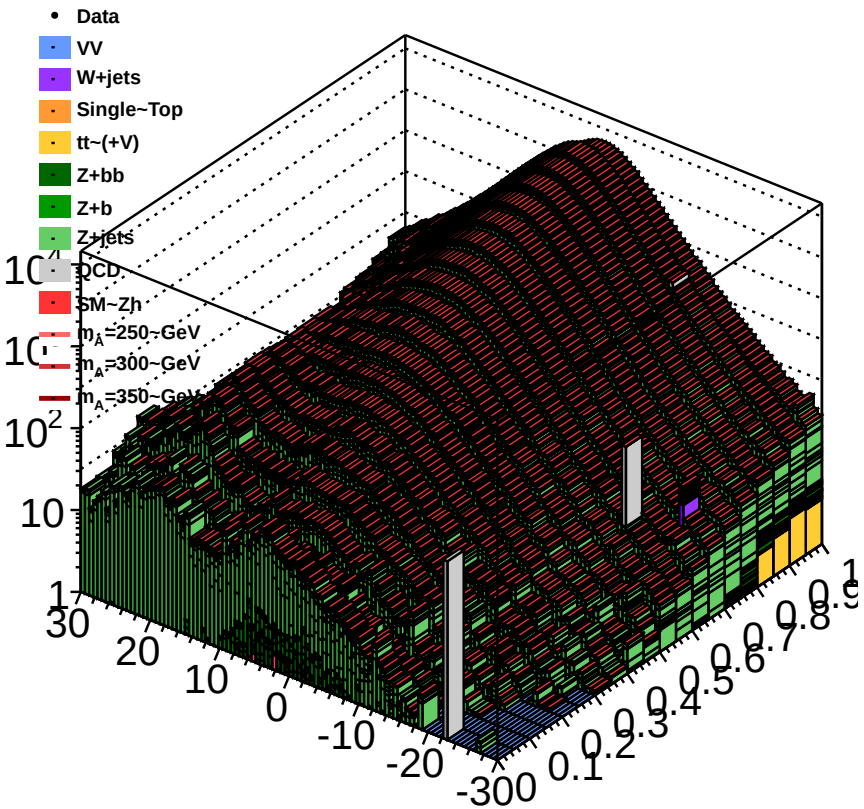

Z1b
Data
VV
W+jets
Single~Top
tt~(+V)
Z+bb
Z+b
Z+jets
QCD
SM~Zh
m_A=250~GeV
m_A=300~GeV
m_A=350~GeV
Events
J_1 mvaId
Data/MC
Data/MC = 1.203 ± 0.012
K-S = 0.000, χ²/ndf = 123.1/98

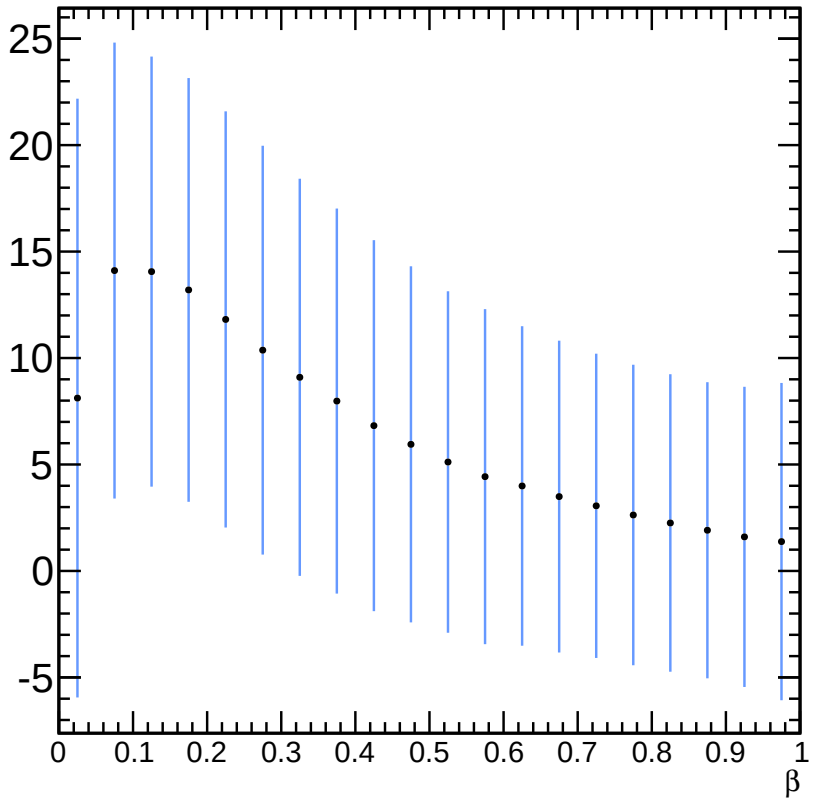
mvaId (II)


Z2b
Data
VV
W+jets
Single~Top
tt~(+V)
Z+bb
Z+b
Z+jets
QCD
SM~Zh
m_A=250~GeV
m_A=300~GeV
m_A=350~GeV
Events
J_1 mvaId
Data/MC
Data/MC = 1.204± 0.016
K-S = 0.001, χ²/ndf = 76.7/98


TTbar
Data
VV
W+jets
Single~Top
tt~(+V)
Z+bb
Z+b
Z+jets
QCD
SM~Zh
m_A=250~GeV
m_A=300~GeV
m_A=350~GeV
Events
J_1 mvaId
Data/MC
Data/MC = 1.081± 0.013
K-S = 0.379, χ²/ndf = 88.5/98

$\Delta E_T = E_T^{reco} - E_T^{genJet}$ vs β

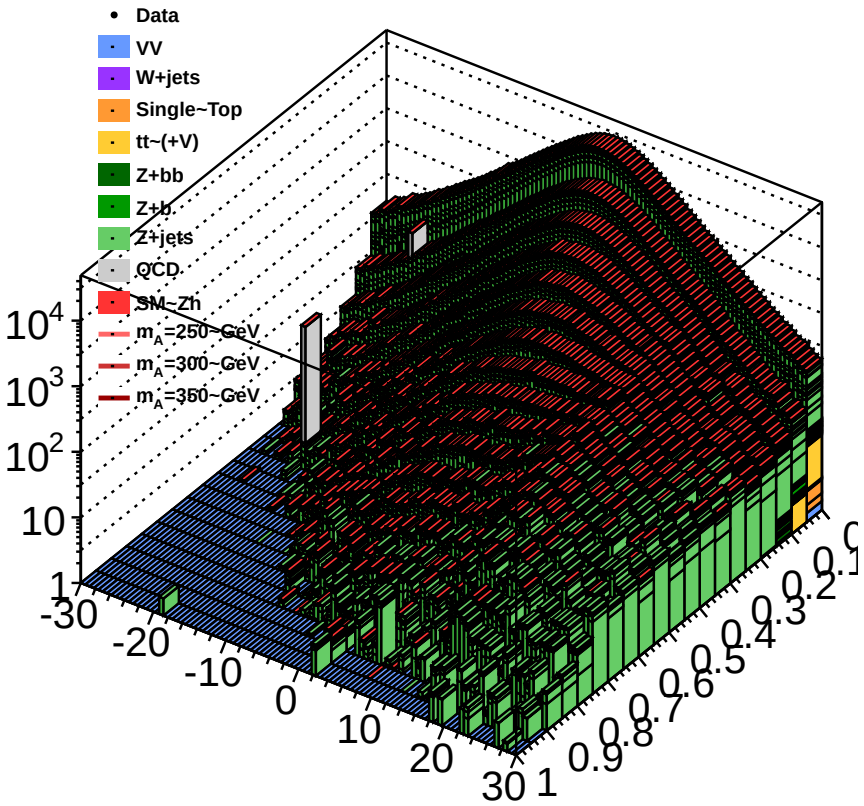


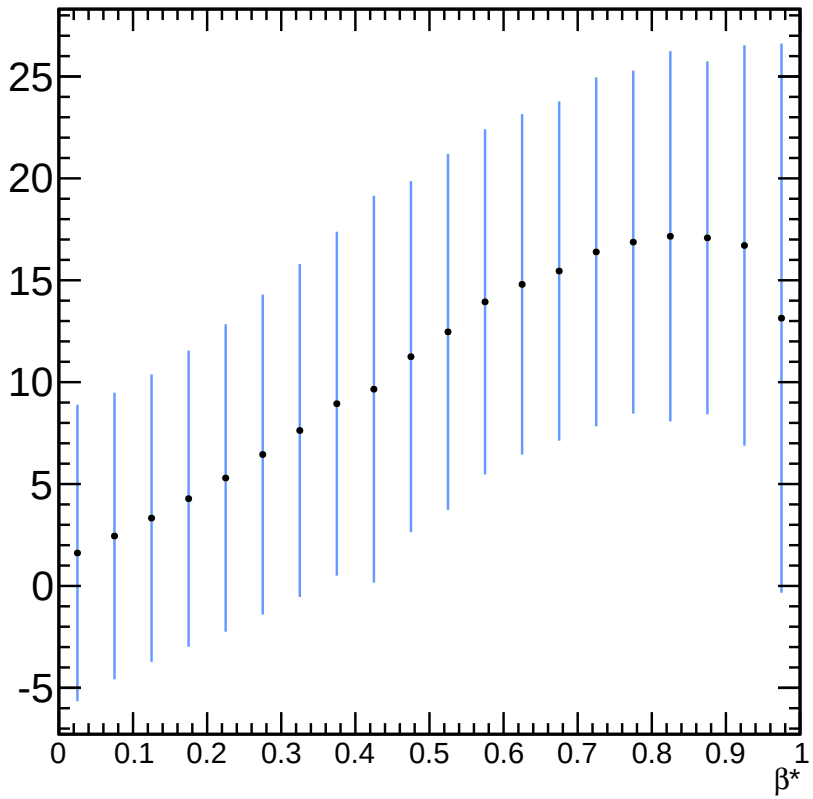


Left: lego plot, all MC samples stacked

Right: profile plot, gaussian fit, mean and σ

$\Delta E_T = E_T^{reco} - E_T^{genJet}$ vs β^*

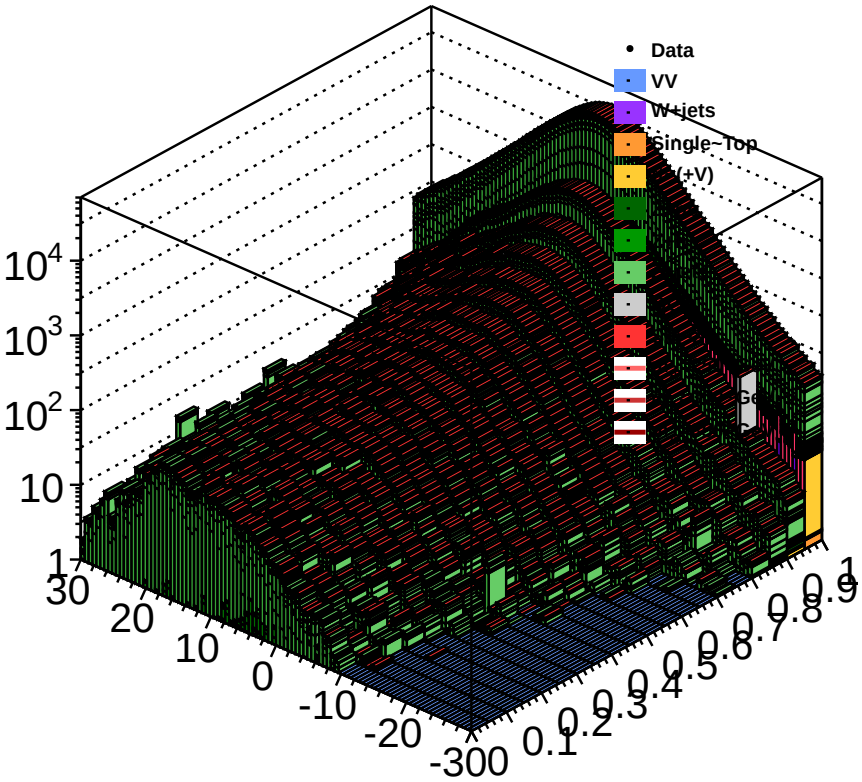


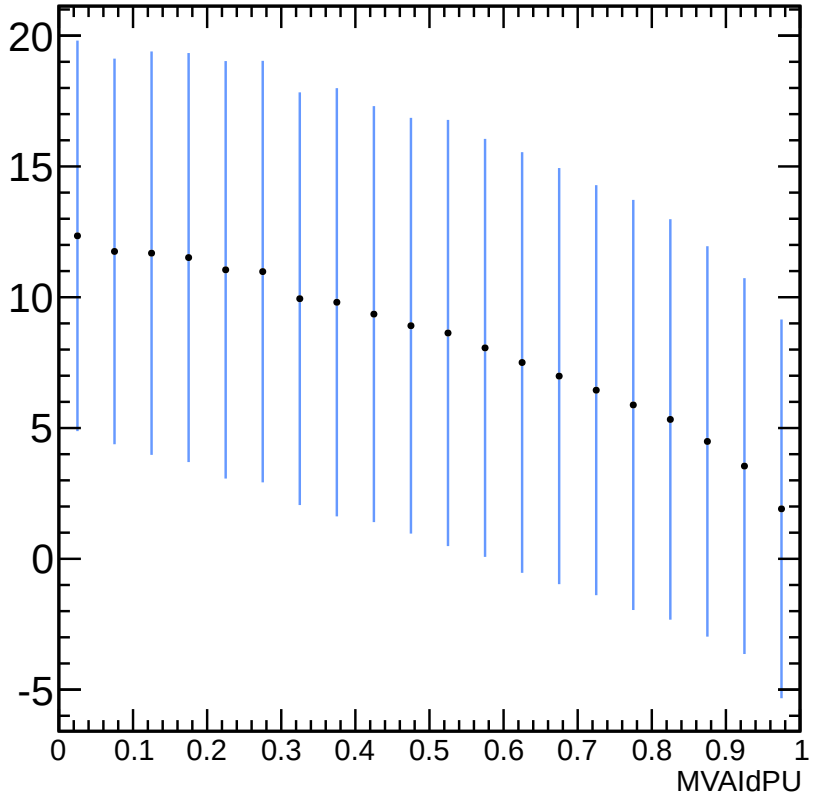


Left: lego plot, all MC samples stacked

Right: profile plot, gaussian fit, mean and σ

$\Delta E_T = E_T^{reco} - E_T^{genJet}$ vs mvaId





Left: lego plot, all MC samples stacked

Right: profile plot, gaussian fit, mean and σ

Conclusion

Distribution

- Agreement is poor for all;
- Improves for β when asking for b-tag.

Profile

- A trend is clearly visible, the more the jet is affected by PU, the larger the bias in ΔE_T;
- width is stable;
- overall mass distribution can be improved by rejecting PU-like jets
- need to check the effect on sensitivity, tough.