

$A_{\text{FB}}^{b(t)}$ measurement potential at 1.4 TeV

Status Update

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Outline

- Introduction & motivation
- Testing a 'signal' MC:
 - Fixed theta distributions after b/c tagging
- Outlook & Summary

Introduction & Motivation

$A_{FB}^{b/t}$ - forward-backward asymmetry of b/t quarks produced in $e^+e^- \rightarrow b\bar{b}/t\bar{t}$

Important tests of the Standard Model.

$$A_{FB} = (N_F - N_B) / (N_F + N_B)$$

Allows the effective weak mixing angle to be determined with high precision.

Such measurements may show some effects of Beyond-SM physics

For example, the left-handed 3rd generation states could be composite...

What if precision tests of b-quark would show up as a deviation from SM...

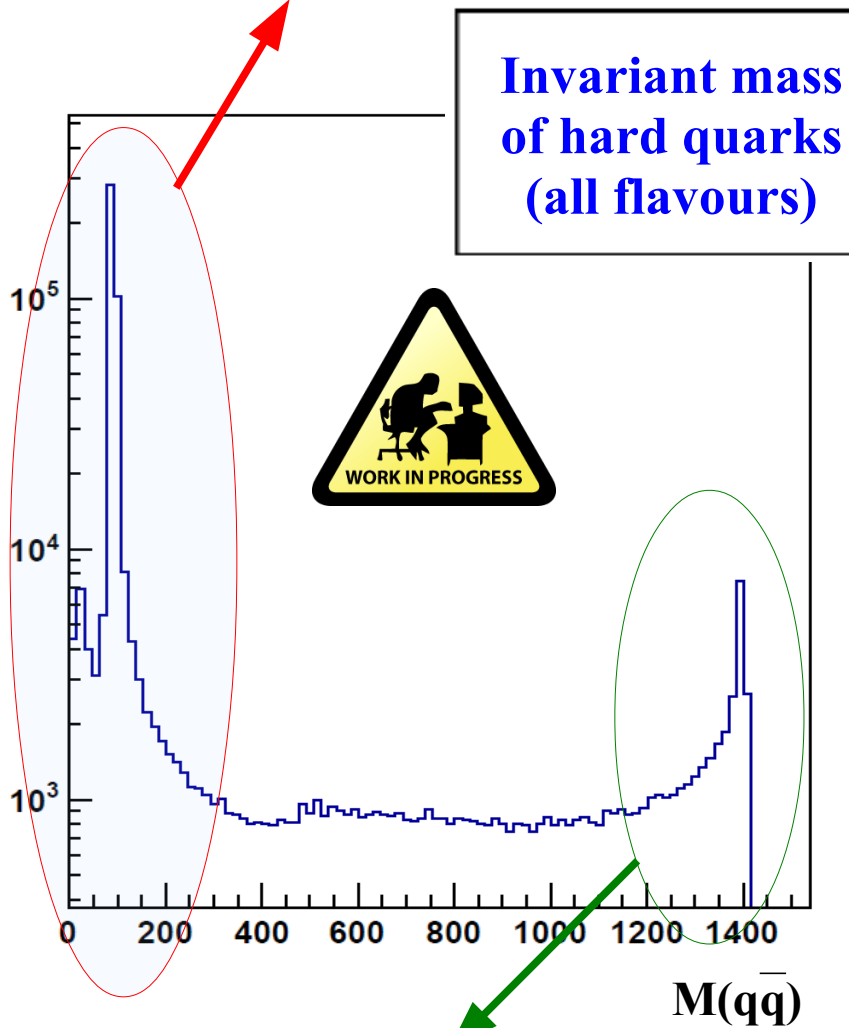
Should the B-factories already see such an effect?

Not necessarily: depending on how sensitive we can get on A_{FB}^b , especially at higher energies

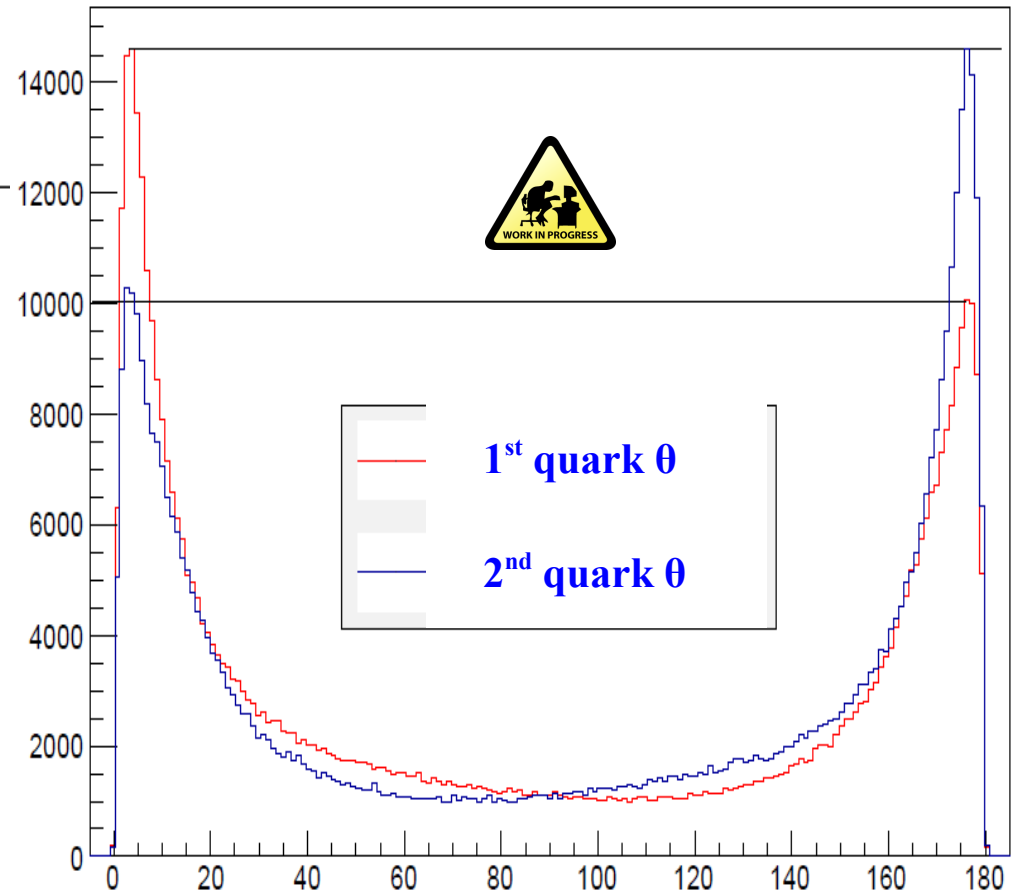
Testing the 'signal' MC

Generator level

Can't compete with
LEP data at Z^0 pole



Aiming for this
region



Acceptance in polar angle – down to 7°

Testing the 'signal' MC

Reconstructed level

Jet definition tests

First approach: test **kt algorithm**

- Using clustering mode with 2 exclusive jets and energy scheme for recombination
- Impact of different radius (**R**) parameter values: from **0.5** to **1.5**
- Testing also three Pandora selections

...

Conclusion:

1.4 TeV peak seemed more pronounced for Pandora with $R = 1.5$

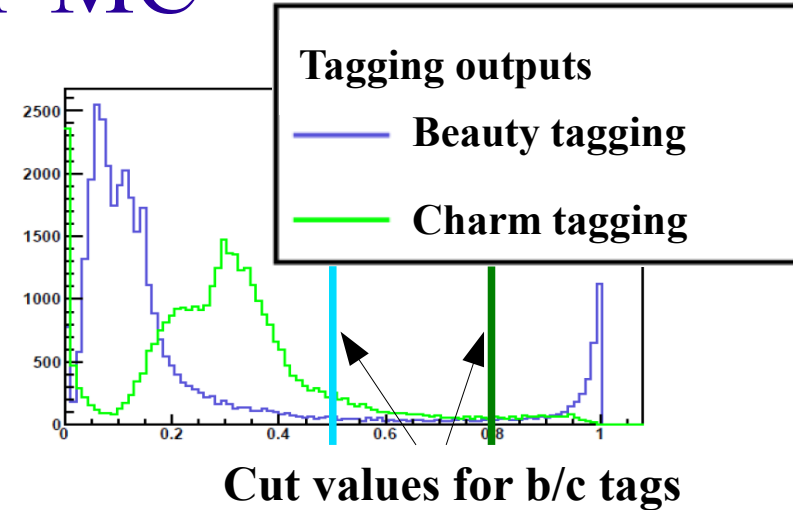
Testing the 'signal' MC

Adding b/c tagging to the picture

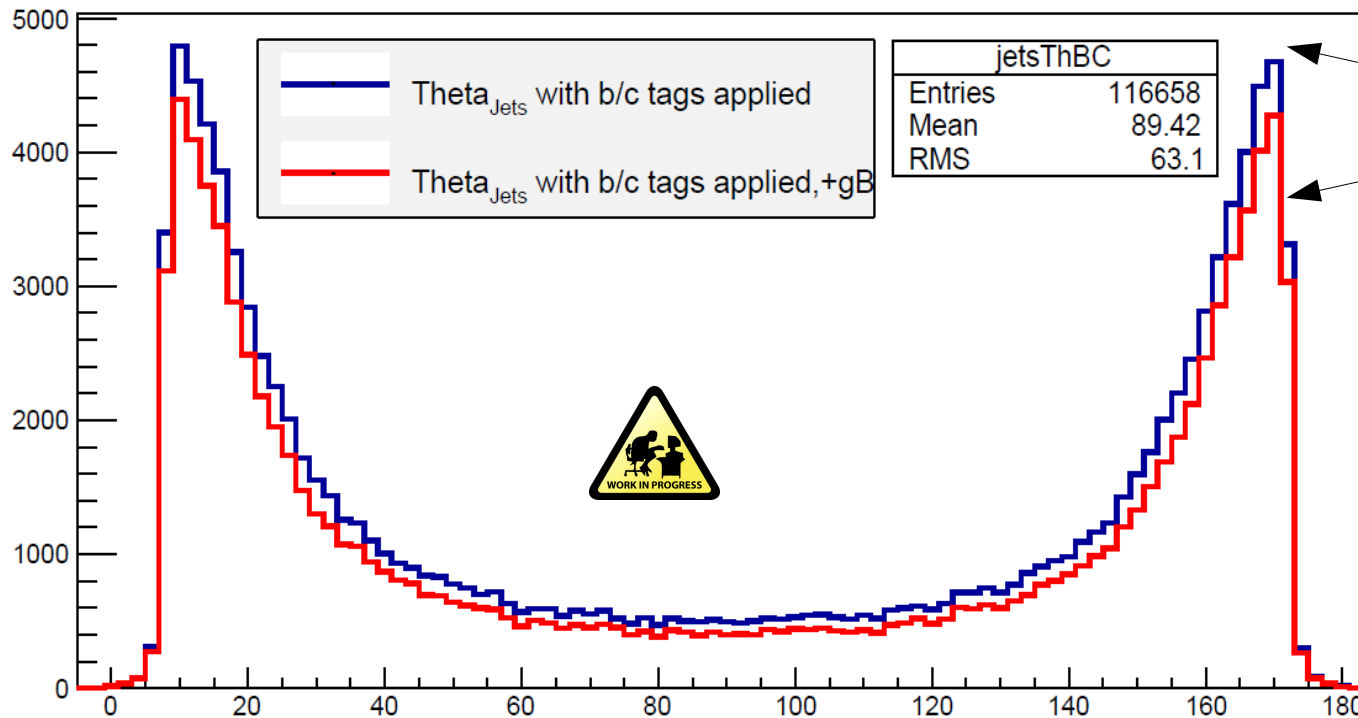
BDT discriminators outputs are provided for each jet separately

Introducing cuts:

- jet is of b/bbar-origin: $\text{rbTag} > 0.5$
- jet is of no-c-origin: $\text{rcTag} < 0.8$



Θ_{Jets} with b/c tags applied



**13%
wrongly
tagged jets**

**gB – flag: on
gen level there
was a b/bbar
pair produced**

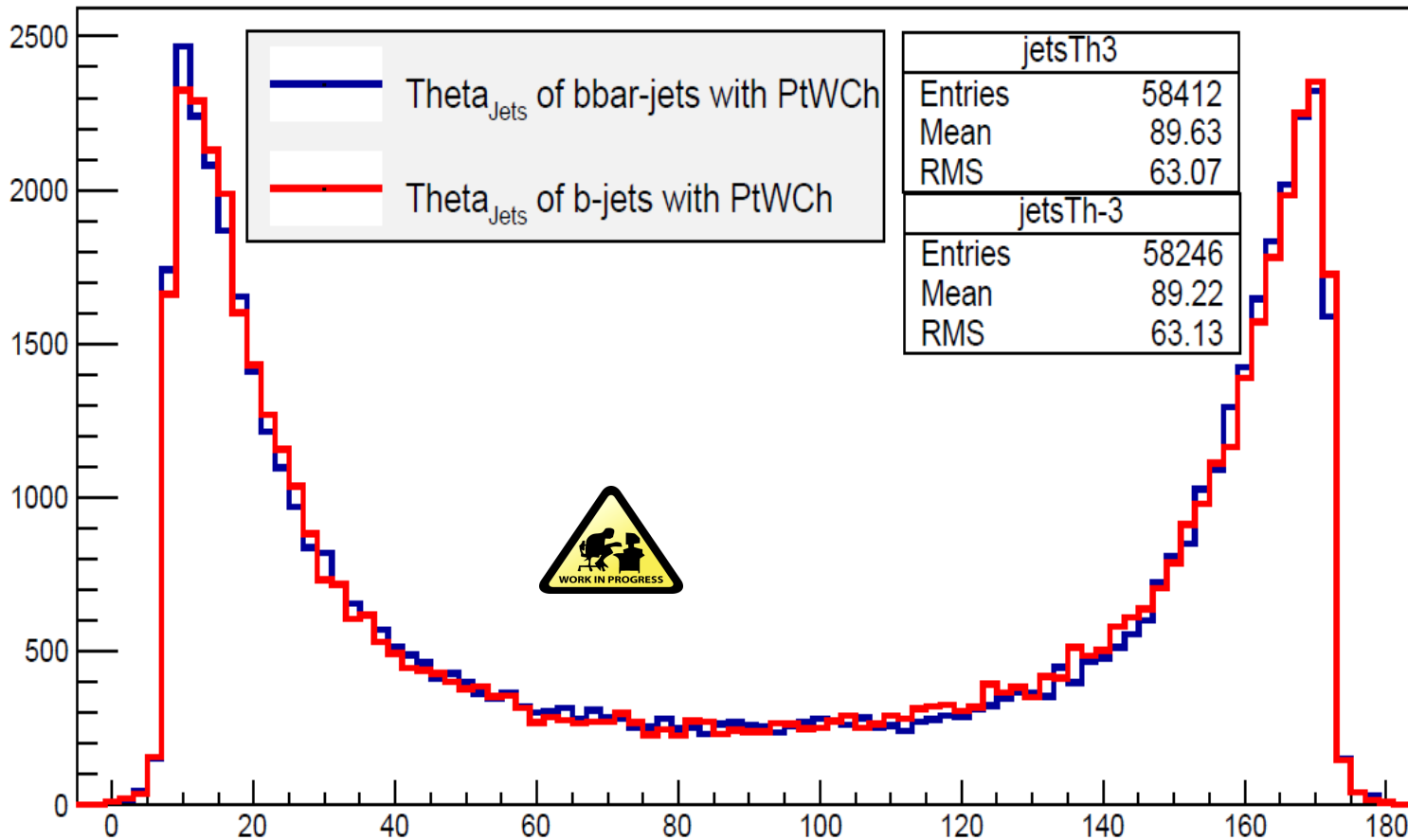
Testing the 'signal' MC

Adding jet charges to the picture

Adding information using sign of a Pt-weighted charge of the jet: $Q_{\text{jet}}^{\kappa} = \frac{\sum_i (p_i^l)^{\kappa} q_i}{\sum_i (p_i^l)^{\kappa}}$

l – longitudinal/transverse/total
 K – 1.0 for Pt / 1.8 for P

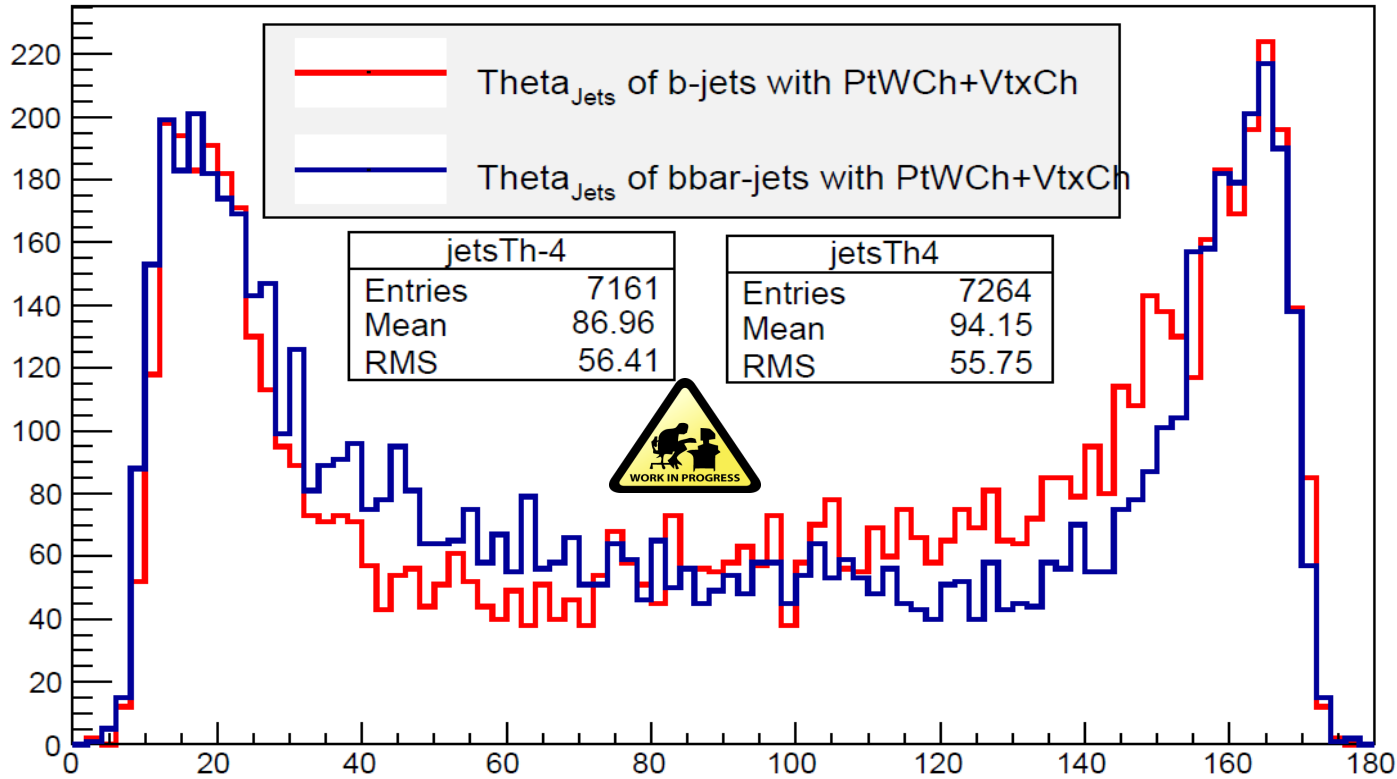
Theta_{Jets} of bbar-jets with PtWCh



Testing the 'signal' MC

Adding secondary vertices and their charge

Theta_{Jets} of b-jets with PtWCh+VtxCh



Follow-up of previous cuts
(b/c tagging+jet_charge)

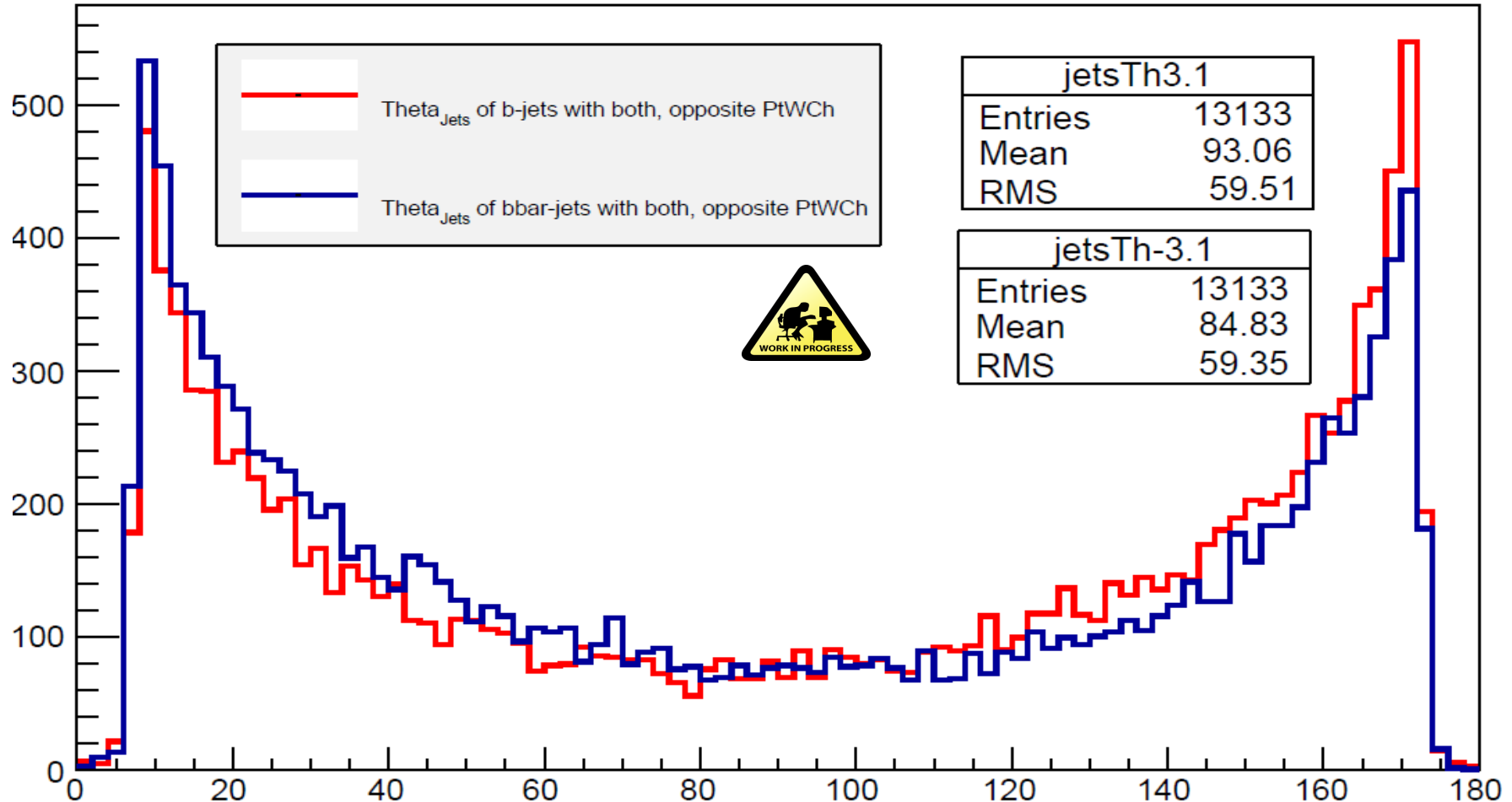
Selecting vertices
belonging to jets' cones:
 $\cos(\text{Jet}, \text{Vtx}) > 0.9$

This simple assignment needs more cross checks – 1/3 of jets have opposite charges for Pt-weighted jet charge and secondary vertex charge

Jet-Vrtx assignment to be changed: number of tracks

Testing the 'signal' MC

Theta_{Jets} of b-jets with both, opposite PtWCh



Opposite-charge-for-PtWCh requirement cuts out almost 80% of the initial sample (2-3% survives out of the total MC sample)

Summary & Outlook

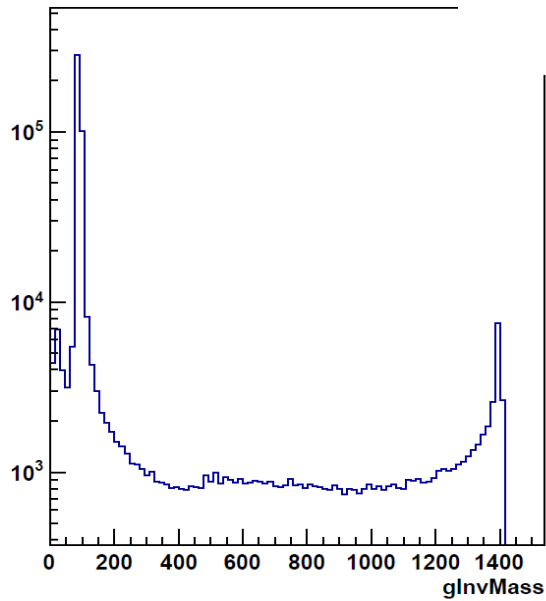
- **Fixed a bug: shapes of theta distributions look much better than before and 'follow' shapes of generator level distributions**
- **Introducing events thrusts to define hemispheres and check their impact on the measurement**
- **κ , b/c tagging cut values, (...) left for finer tuning and comparison with background MC**

Thank you for your attention

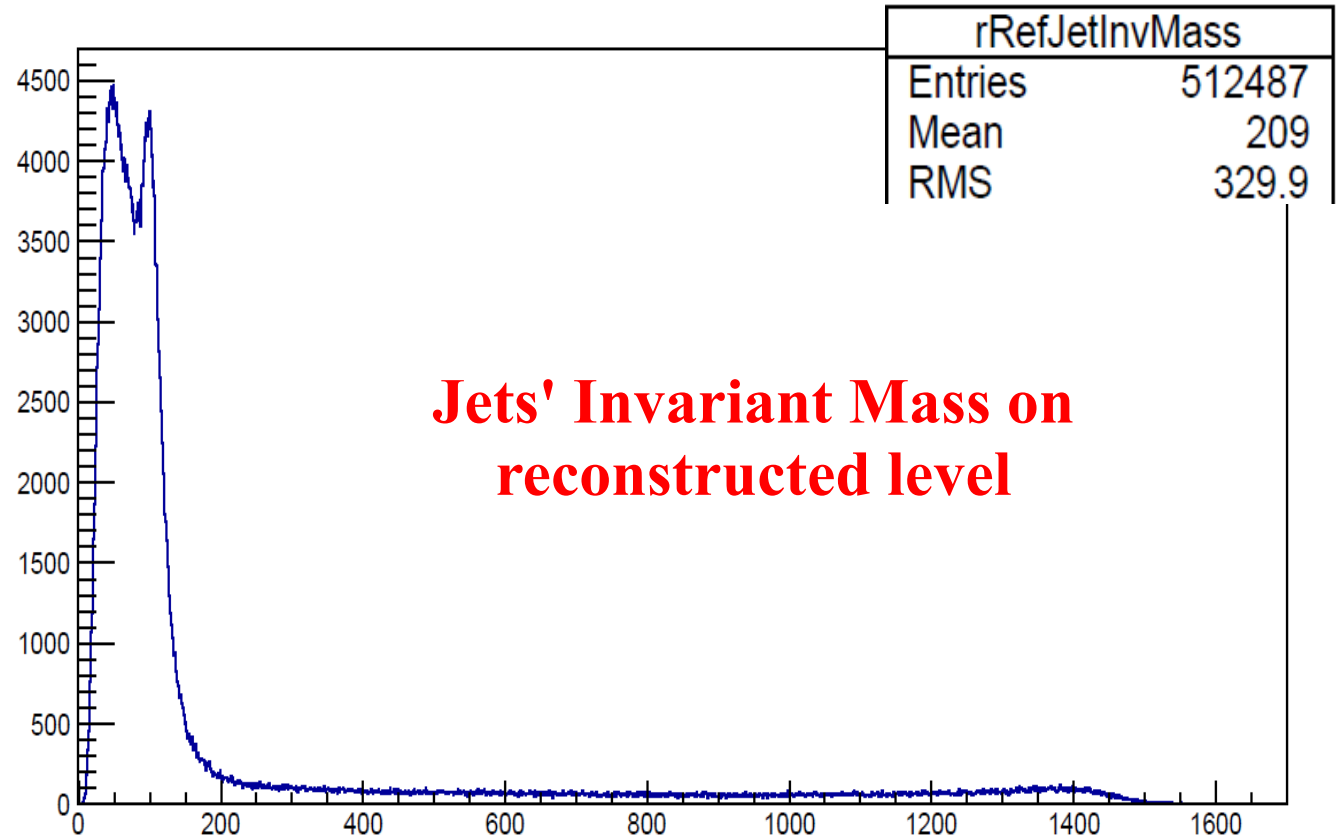
Backup slides

Testing the 'signal' MC

Reconstructed level



**Peak at 1.4TeV
gets smeared out**



**Jets' Invariant Mass on
reconstructed level**

Testing the 'signal' MC

Theta_{Jets} of b-jets with opposite PtWCh+VtxCh

