

# Forward-backward asymmetries for b and t quarks at CLICdp

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*(on behalf of the CLICdp Collaboration)*



*Epiphany 10.01.2015*

# Outline

- Introduction & motivation
- Analysis details
  - Generator level
  - Jets and 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

# Analysis details

First look into the  $A_{\text{FB}}^b$  measurement potential. Next step: move to top quarks

Monte Carlo simulations computed for the ILD detector concept

→ Source of signal:  $b\bar{b}$  pairs in  $e^+e^- \rightarrow q\bar{q}$  type MC

→ As additional source of background  $e^+e^- \rightarrow qq\nu\nu$  processes will be considered

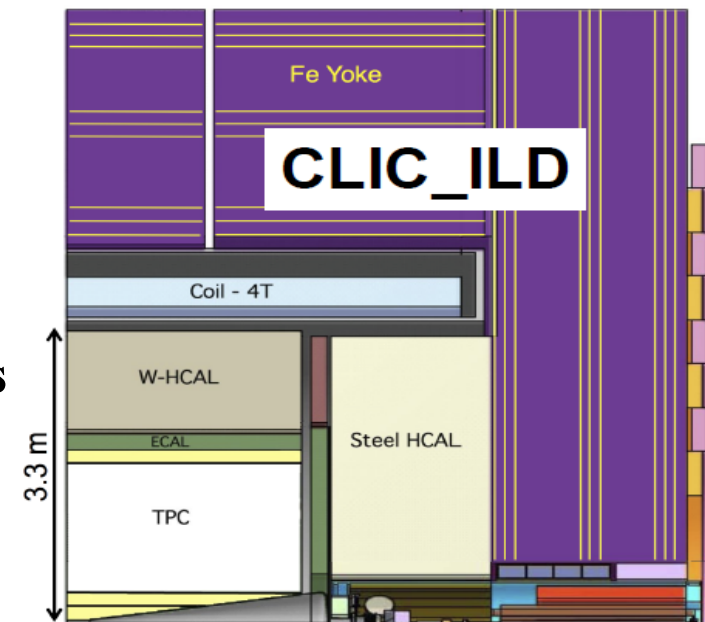
## Jet definition

kT algorithm: clustering mode with 2 exclusive jets energy scheme for recombination

Radius parameter from 0.5 to 1.5

More details on detector concepts

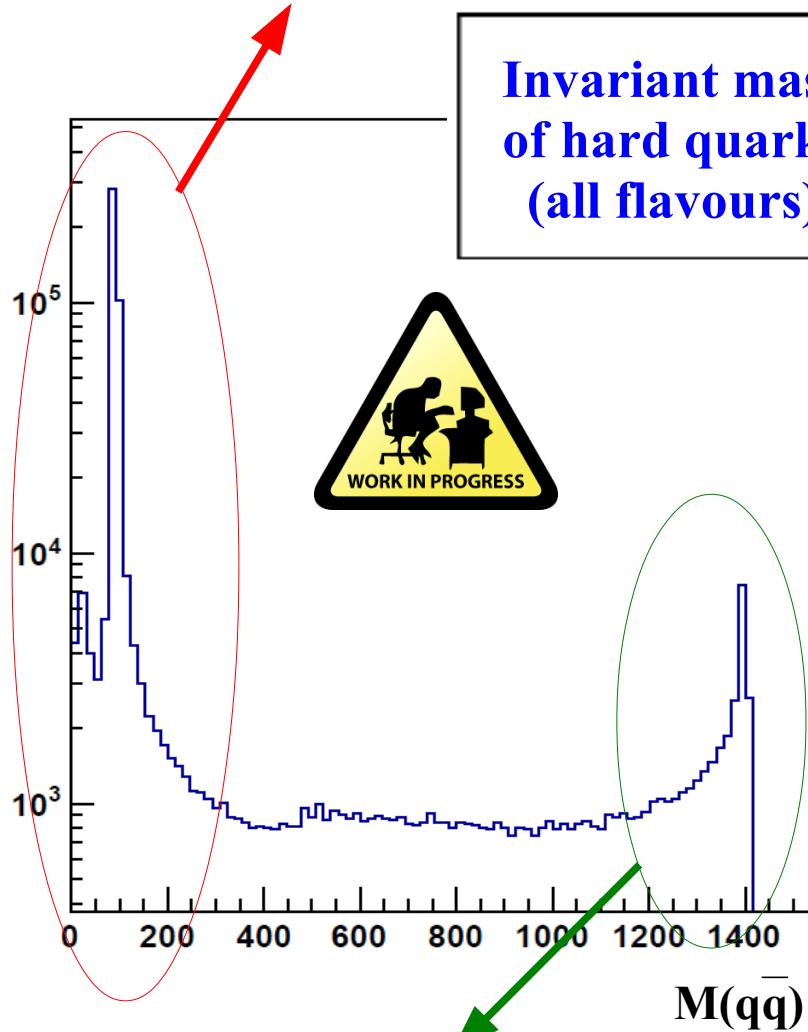
→ *see talk by Lucie Linssen*



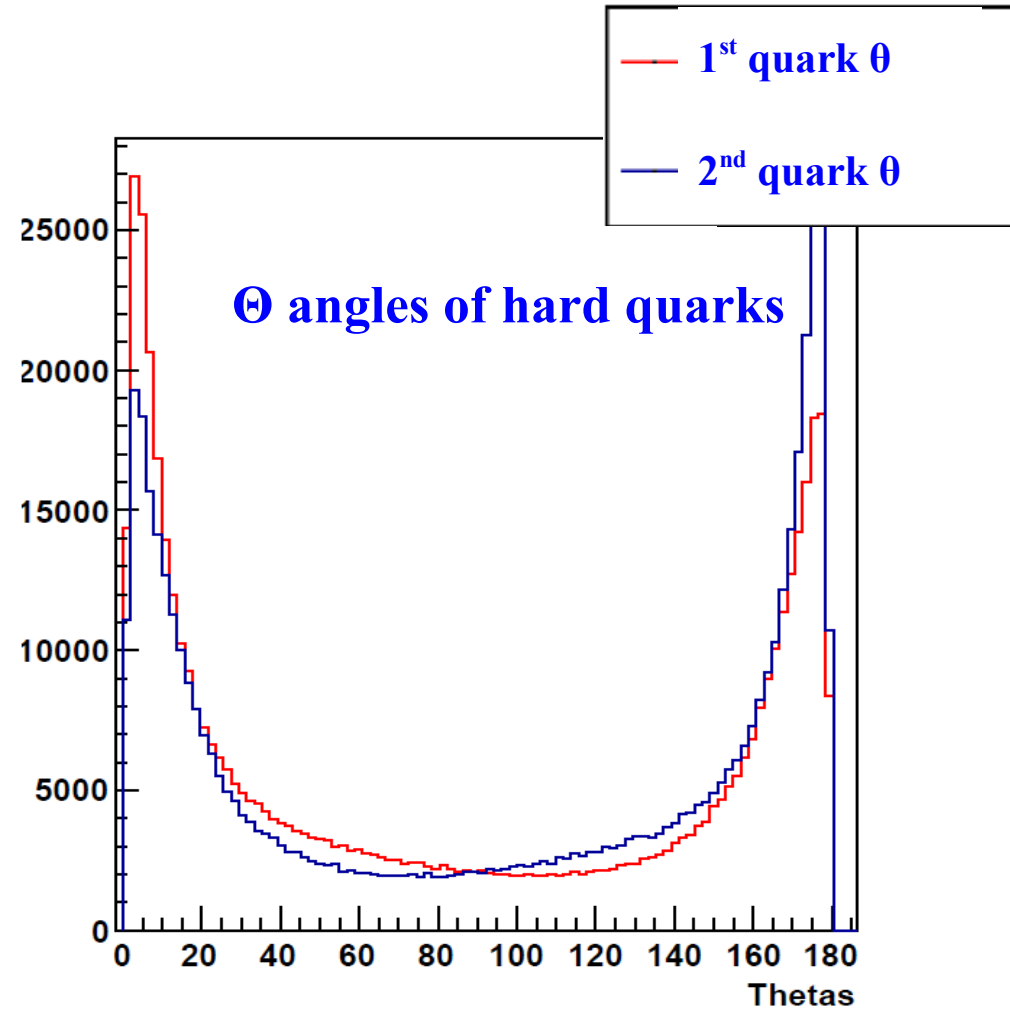
# Testing the 'signal' MC

Generator level

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



Aiming for this  
region



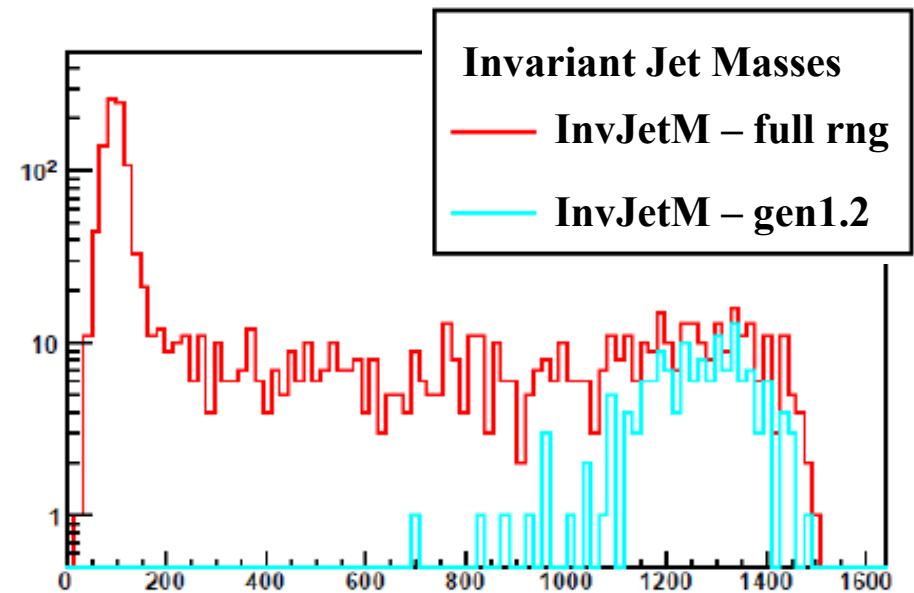
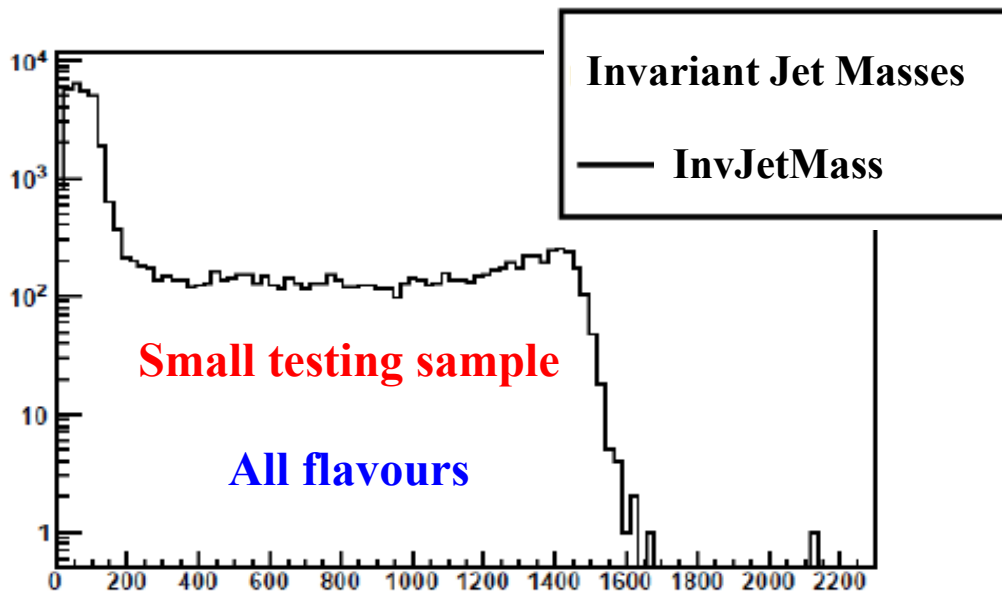
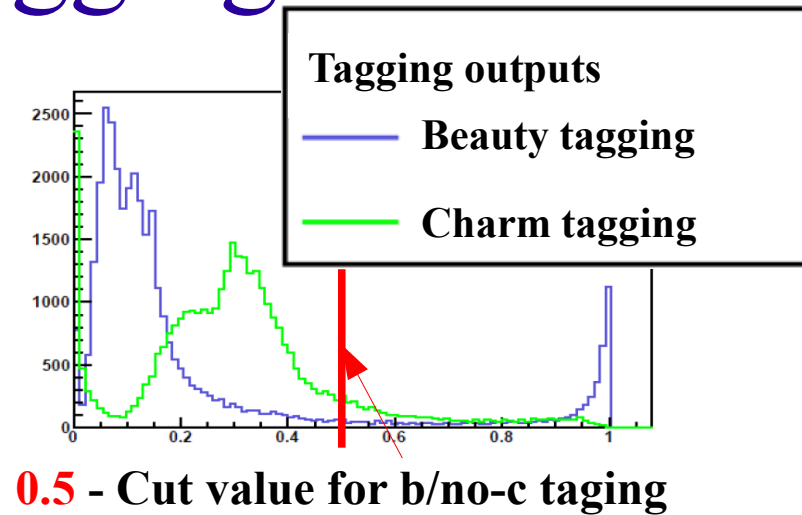
Acceptance in polar angle – down to  $7^\circ$

# Beauty/charm tagging

Tagging procedures for b/c quarks available for testing

BDT discriminators outputs are provided for each jet separately

~2% wrongly tagged in the b-tagged set



# Summary & Outlook

- **Sensitivity on beauty/top forward-backward asymmetries worth checking**
- **Very early stage of the analysis**
- **b/c-tagging procedure gives promising results**
- **A LOT of room for development and improvements**

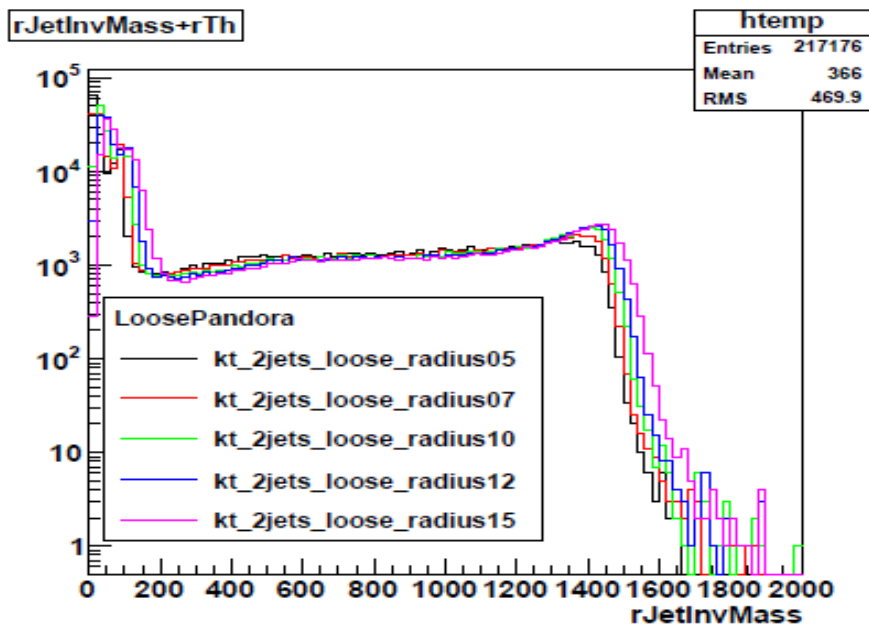
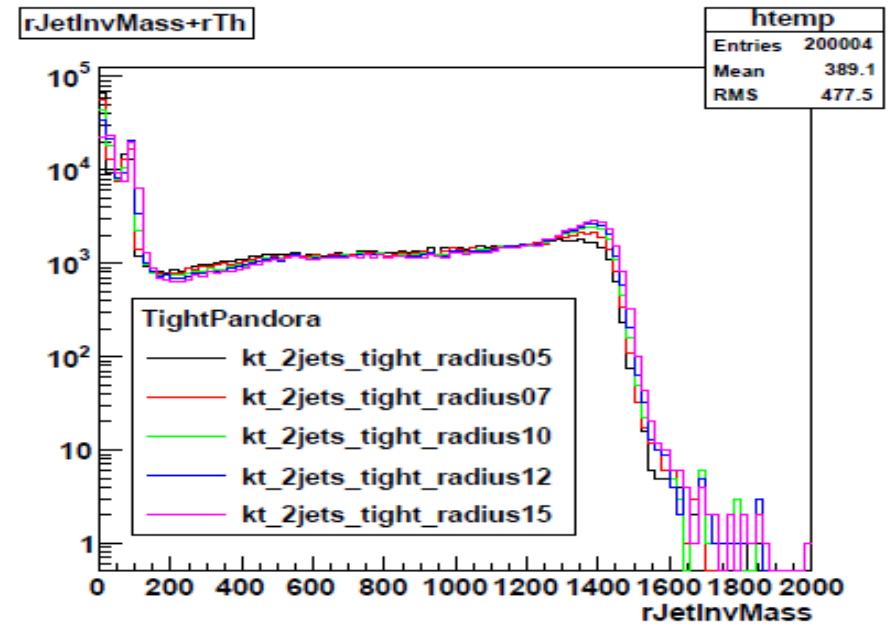
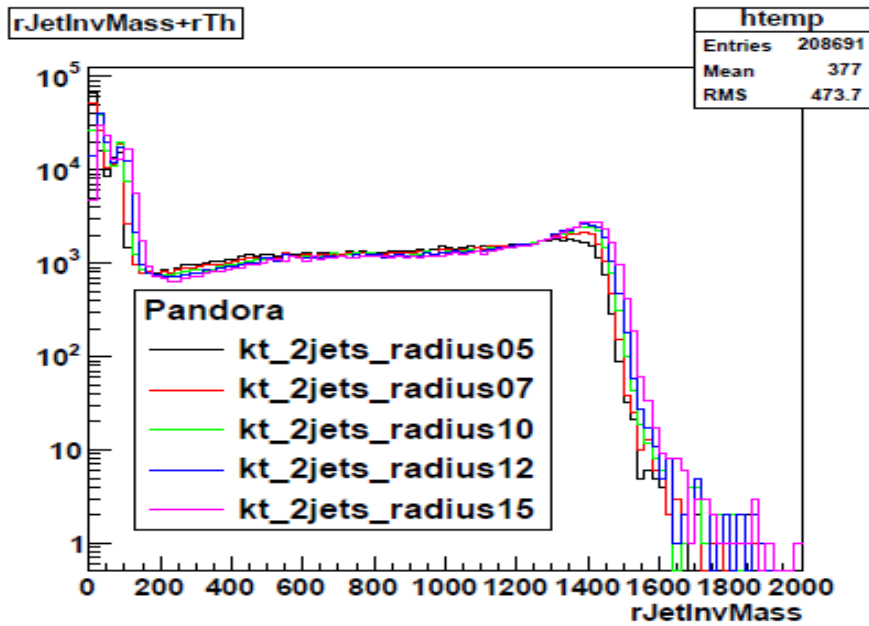
Thank you for your attention



# Backup slides

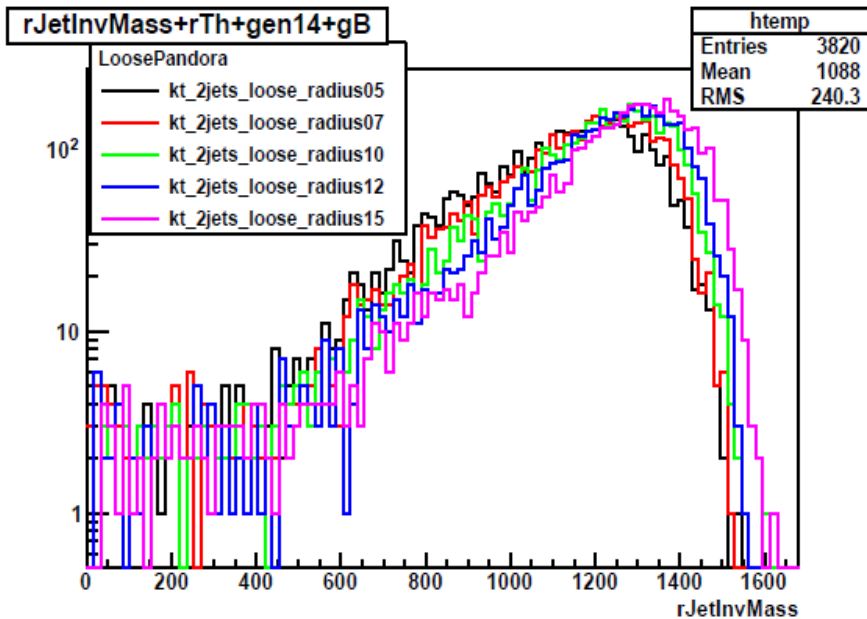
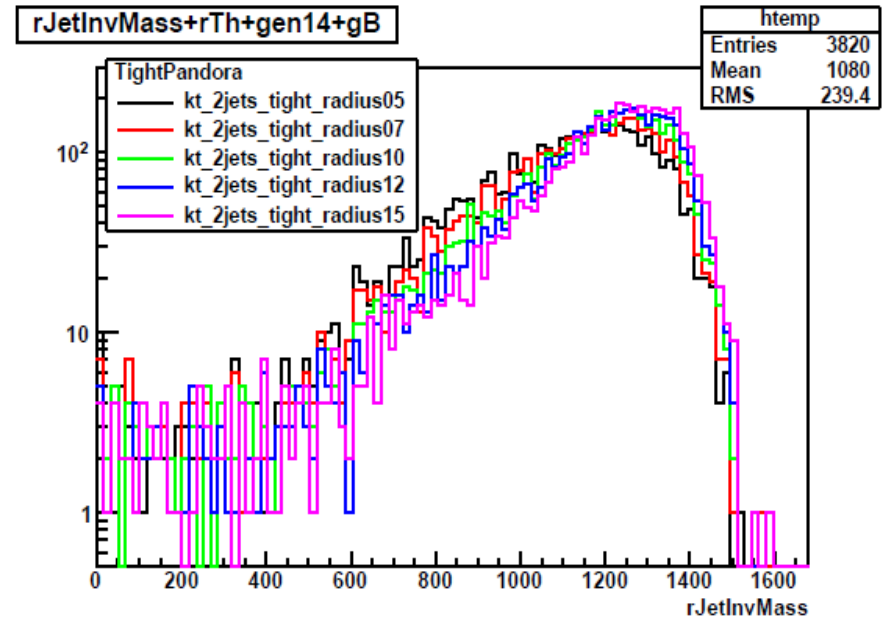
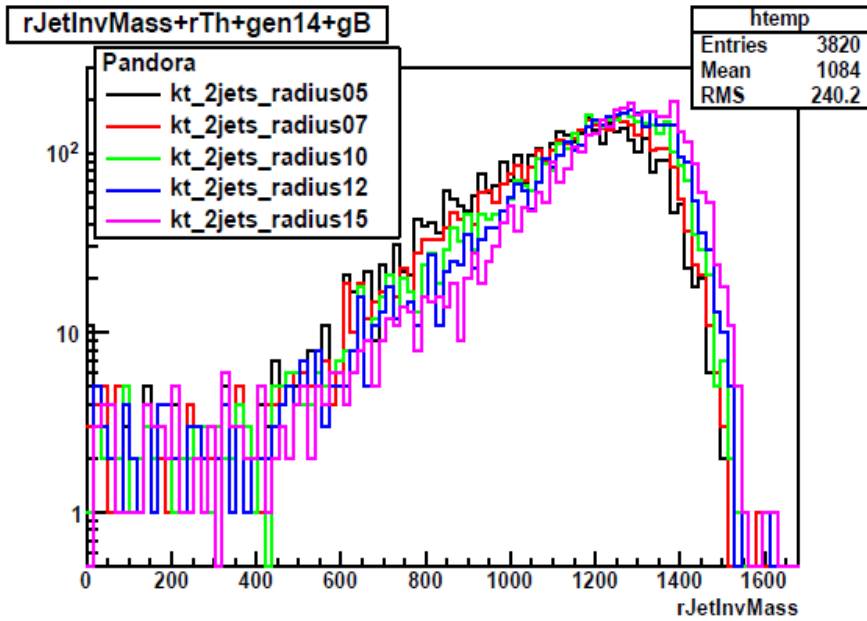
# Testing the 'signal' MC

## Reconstructed level



# Testing the 'signal' MC

## Reconstructed level



**R = 1.5 seems to have a slightly better jet resolution**

**Pandora set selection shifts a peak (see also in backup)**

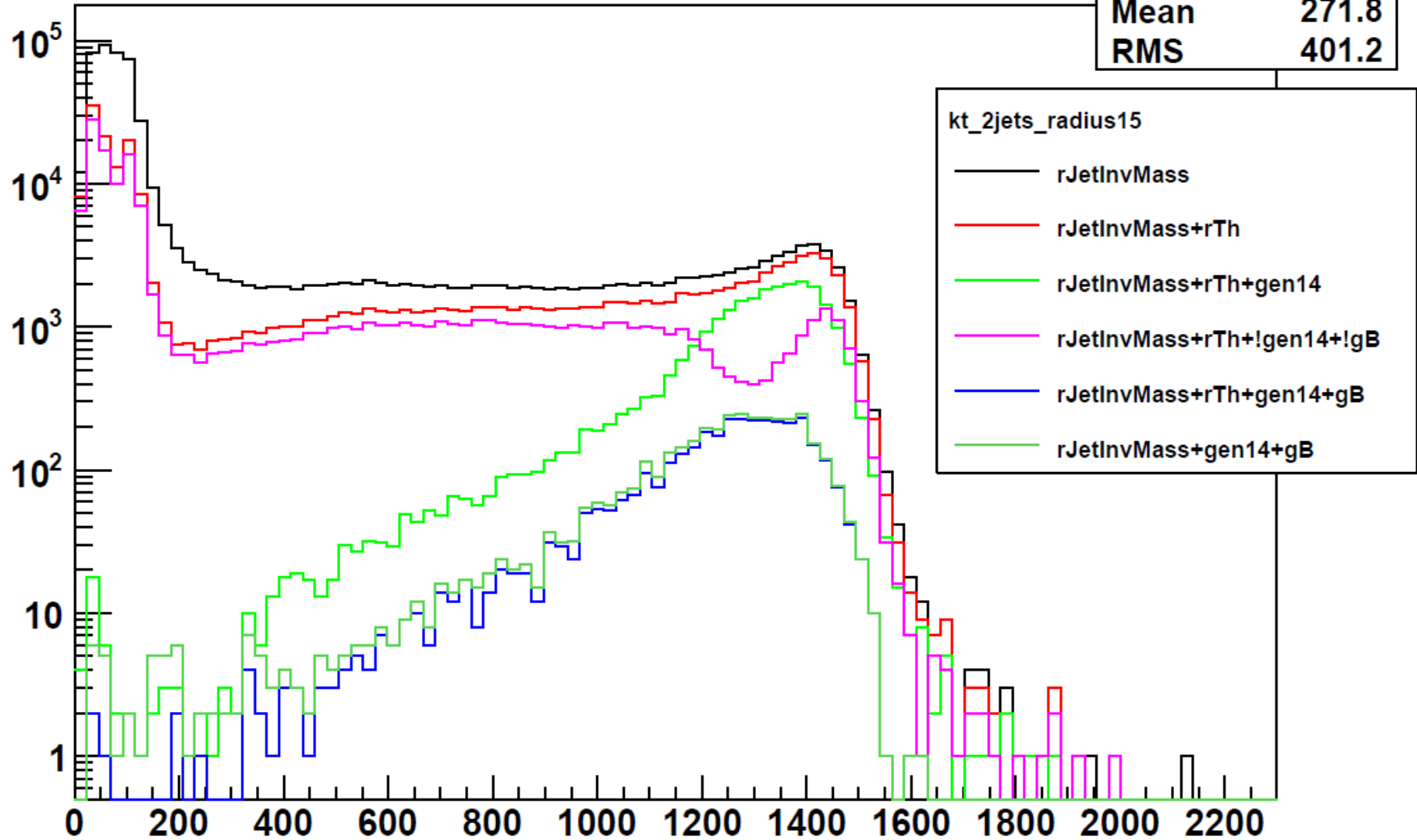
**Chosen for further tests:  
'normal' Pandora  
R=1.5**

# Testing the 'signal' MC

## Reconstructed level

rJetInvMass with different cuts

rJetInvMass	
Entries	513486
Mean	271.8
RMS	401.2



Invariant mass of two reconstructed jets