# B study in the CMS experiment
# -intermediate report-

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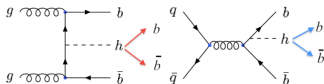
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# The Physics

## Process under study

- At LHC, Higgs bosons can be produced in association with $b$ quarks



- Of all SM processes, multijet production is the major source of background (bg).

- Accurately identified b-jets will help to reduce bk from hadronization of light quarks and gluons.
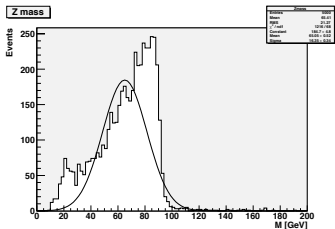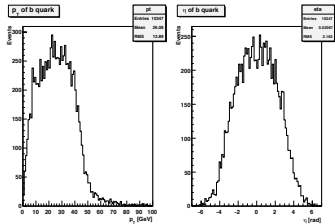
## Why investigating in this particular decay channel?

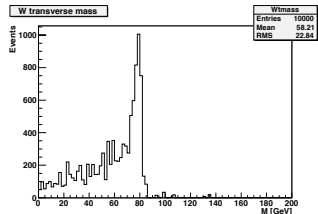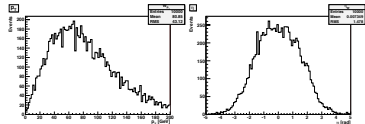- High branching ratio for lower Higgs masses
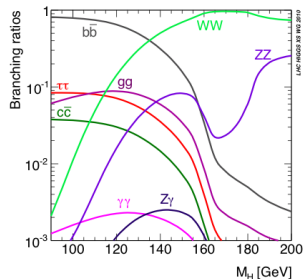
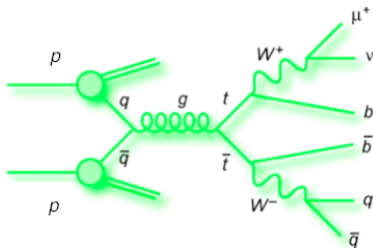# Exercises with MC samples

- Pythia generation of $Z \to b\bar{b}$





- Pythia generation of $p\bar{p} \to t\bar{t}$
- Selection of $W \to \mu\nu_\mu$

# Measuring B-tag efficiency



Top quark based method

From this process:

- Construction of b - enriched MC samples:
    - $t\bar{t} \to \mu + \text{jets}$
    - $t\bar{t} \to (\text{Non } \mu + \text{jets})$
    - QCDMuEnriched
    - $W \to \mu\nu_\mu + \text{jets}$
    - $W \to \tau\nu_\tau + \text{jets}$
    - Zbb
    - Wbb (Not yet available in the Summer11 samples)
    - $Z \to \mu\mu + \text{jets}$
- MC luminosity $L = \frac{N}{\sigma \cdot f_{eff}}$
  ($f_{eff}$ = filter efficiency)

# Next

**To do:**

- Isolating jet samples enriched in b-jet using a likelihood ratio:

$$L = \prod_i \frac{f_i(x_i)}{1 - f_i(x_i)}$$

where $x_i$ is a kinematical variable (ex.MET etc.)

**Efficiency calculation**

$$\varepsilon_b = \frac{x_{tag} - \varepsilon_0(1 - x_b)}{x_b}$$

- $x_b^{(MC)} = \frac{b_{jets}}{all_{jets}}$, $x_{tag}^{(Data)} = \frac{tag_{jets}}{all_{jets}}$
- $\varepsilon_0 =$ mistag rate estimation