

RHNM Status report

Study of final state of
 $e^+e^- \rightarrow t\bar{t}\bar{Z}' \rightarrow t\bar{t}\bar{Z}$ *inv.* events

Outline

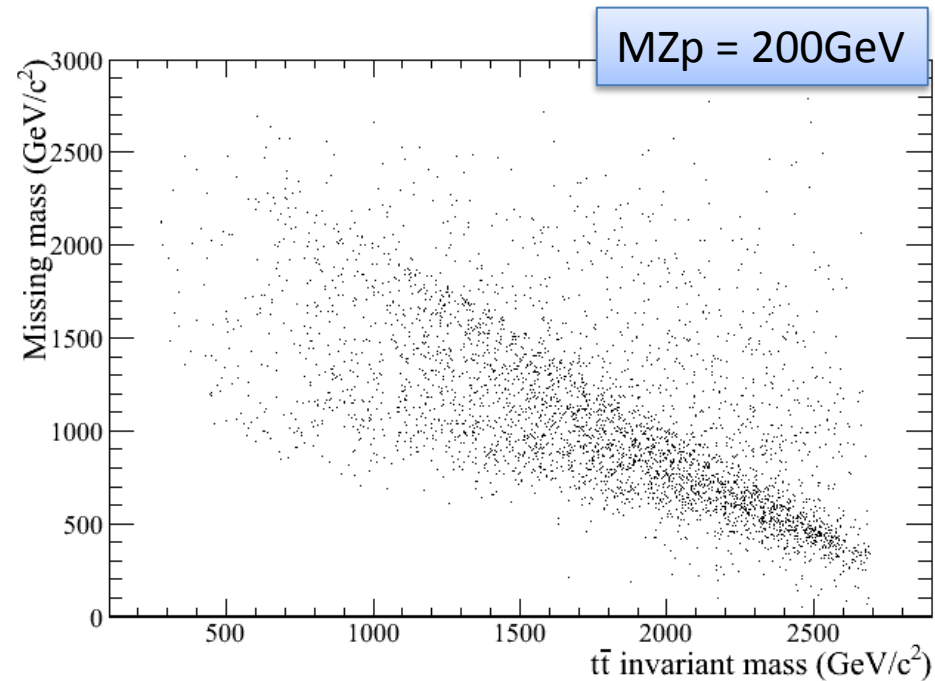
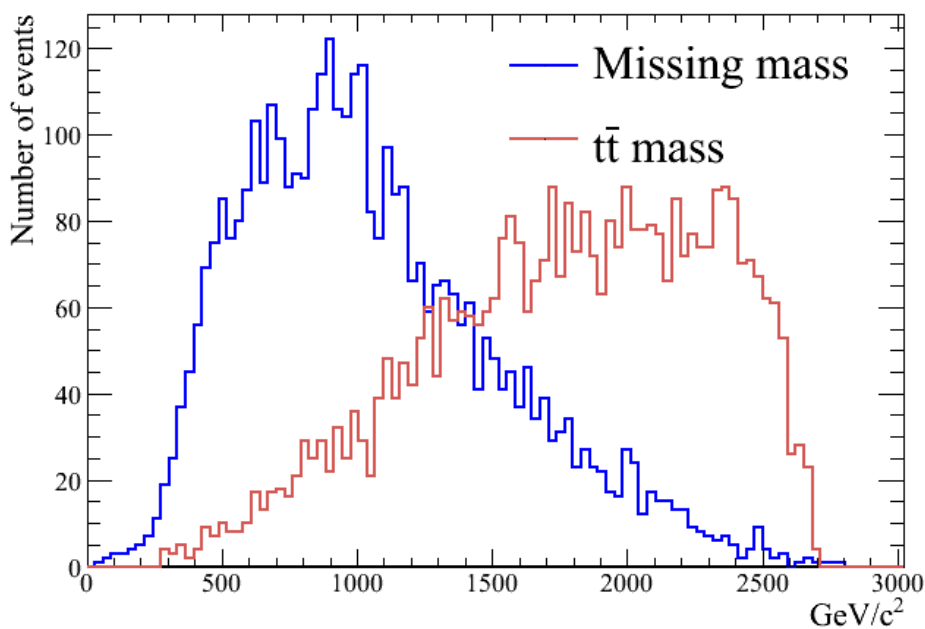
- Framework
- Measure Z' mass
- Analysis
- Purifying the samples
- Jet Energy resolution
- Discussion and outcome

Framework

- The model:
 - Z' boson couples to t_R only in the SM
 - Z' couples to ν_R , dark matter candidate
 - ν_R mass $\sim M_Z/2 = 50$ GeV
 - Z' mass $\sim 200 - 300$ GeV
 - “high” couplings involved ($g_{tr}=3$, $g_{Zp}=3$)
- 3 TeV e^+e^- collisions
- $\sigma \sim 10\text{fb}$
- $\text{Br}(Z_p \rightarrow \text{inv.}) \sim 20\%$

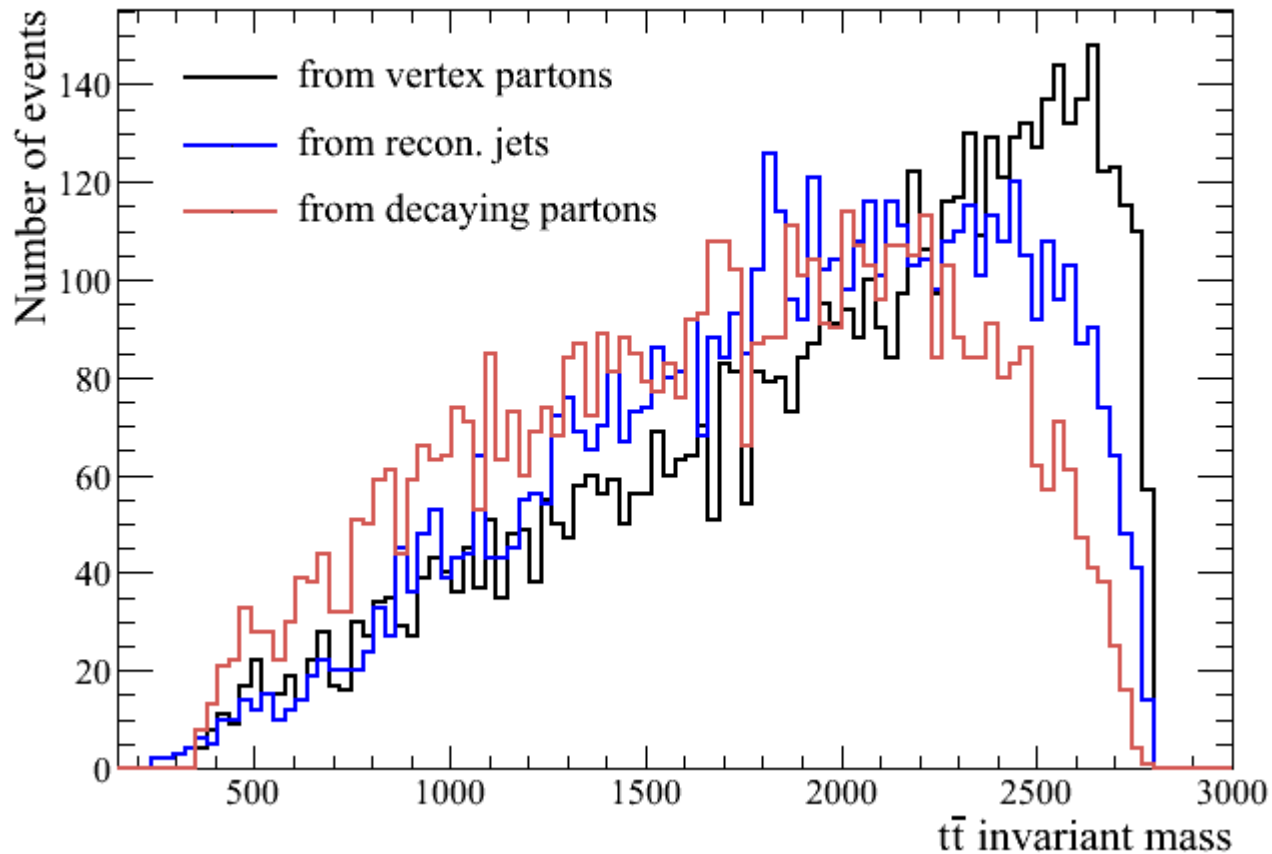
Measure the Z' mass

- Missing mass spectrum is highly degraded when switching on ISR
- M_{Zp} found in $t\bar{t}$ system invariant mass

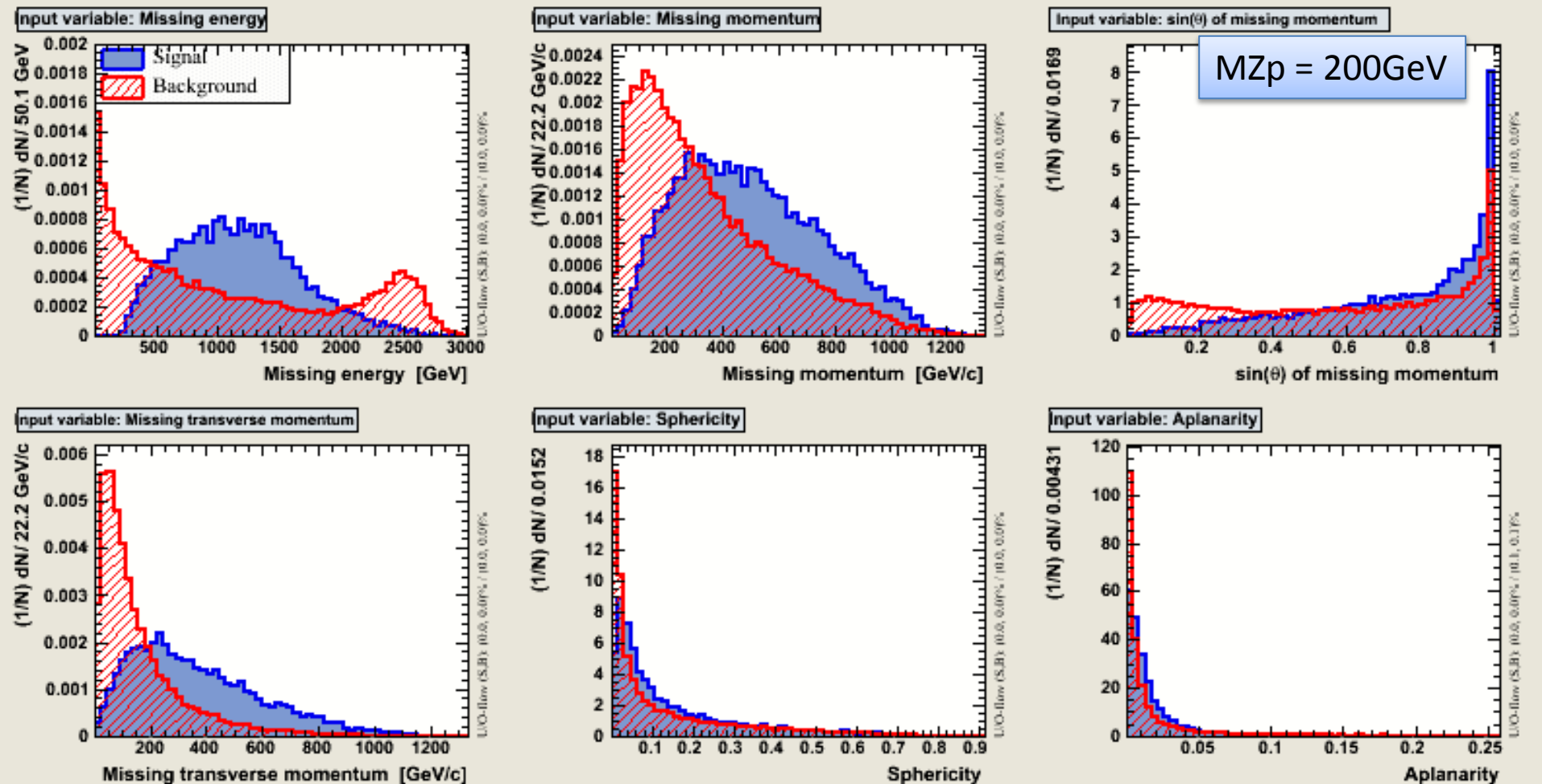


$t\bar{t}$ system invariant mass

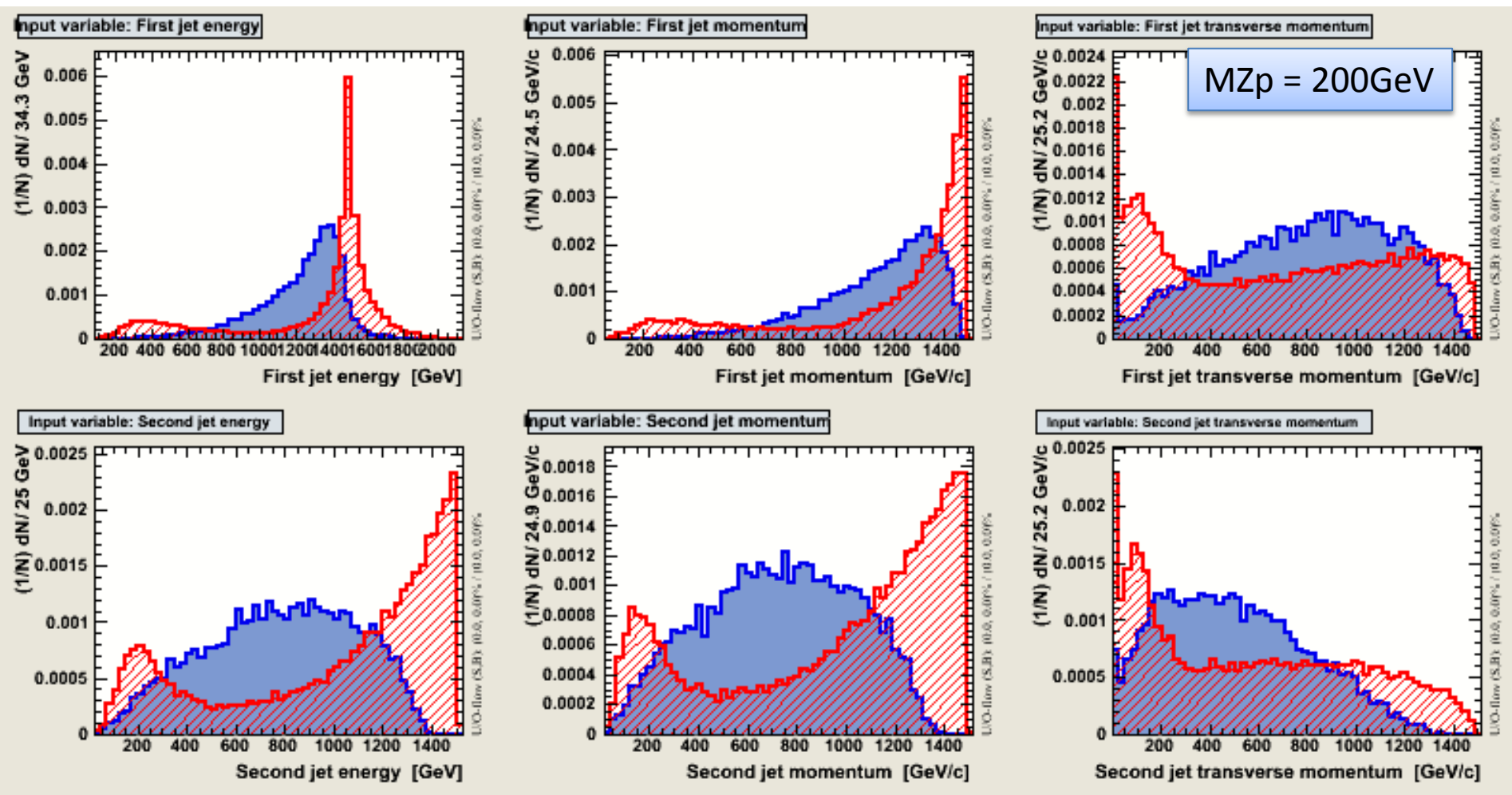
$M_{Zp} = 200\text{GeV}$



Analysis: Input variables

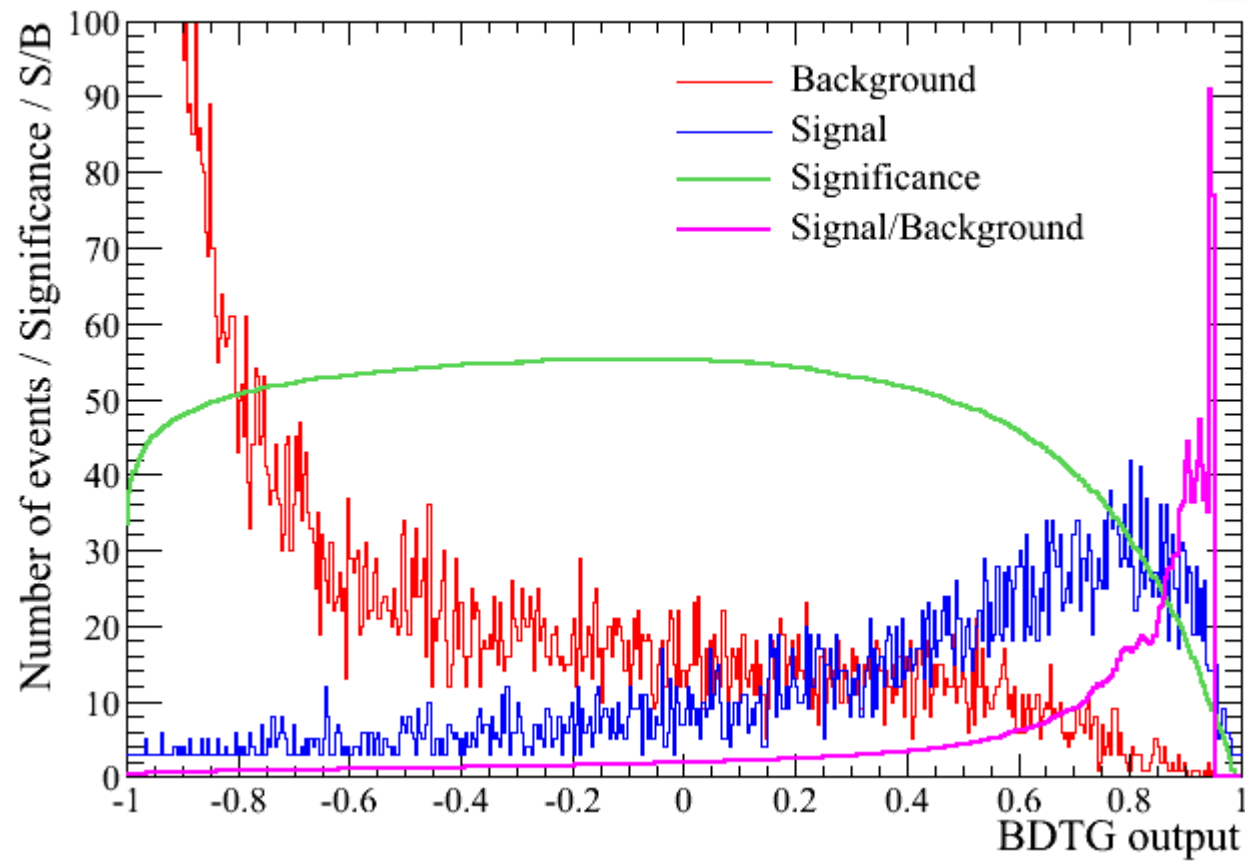


Analysis: Input variables



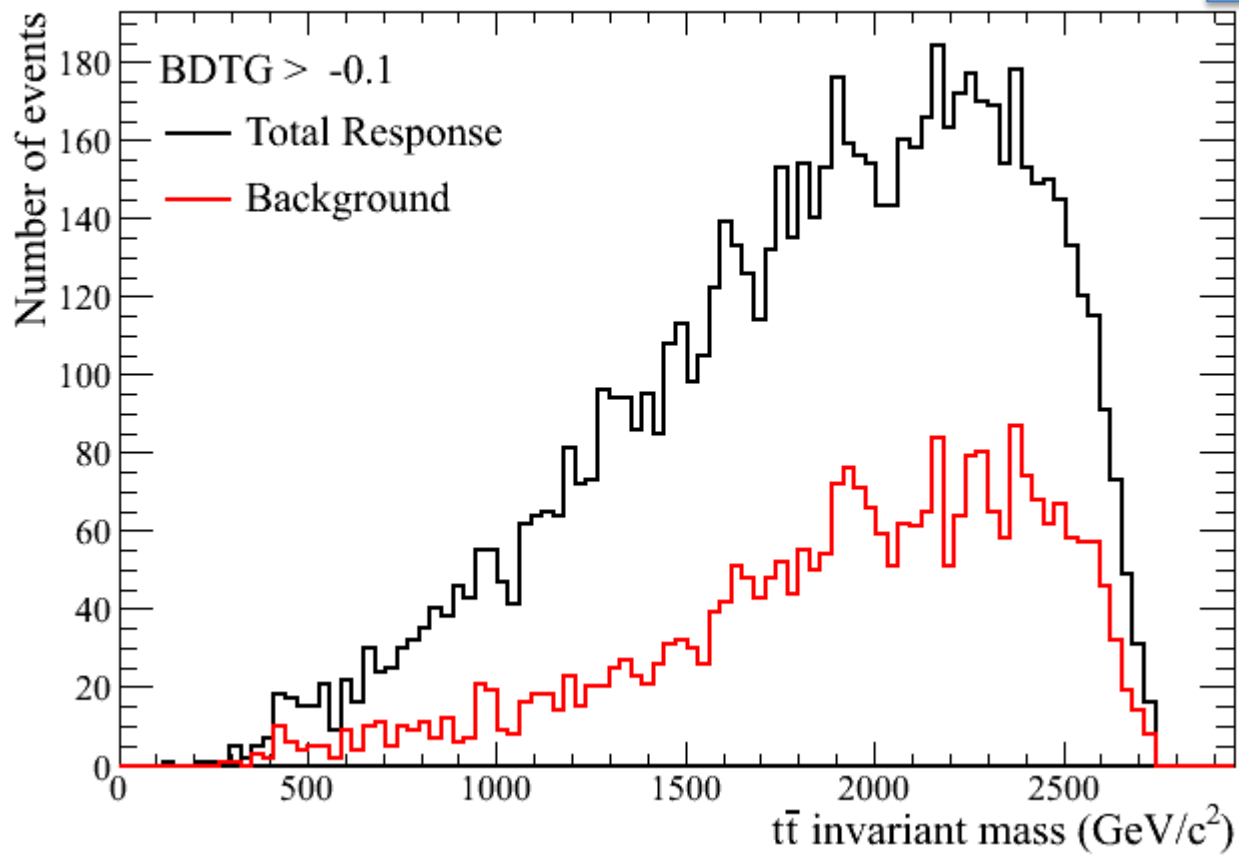
Analysis: classifier output

MZp = 200GeV



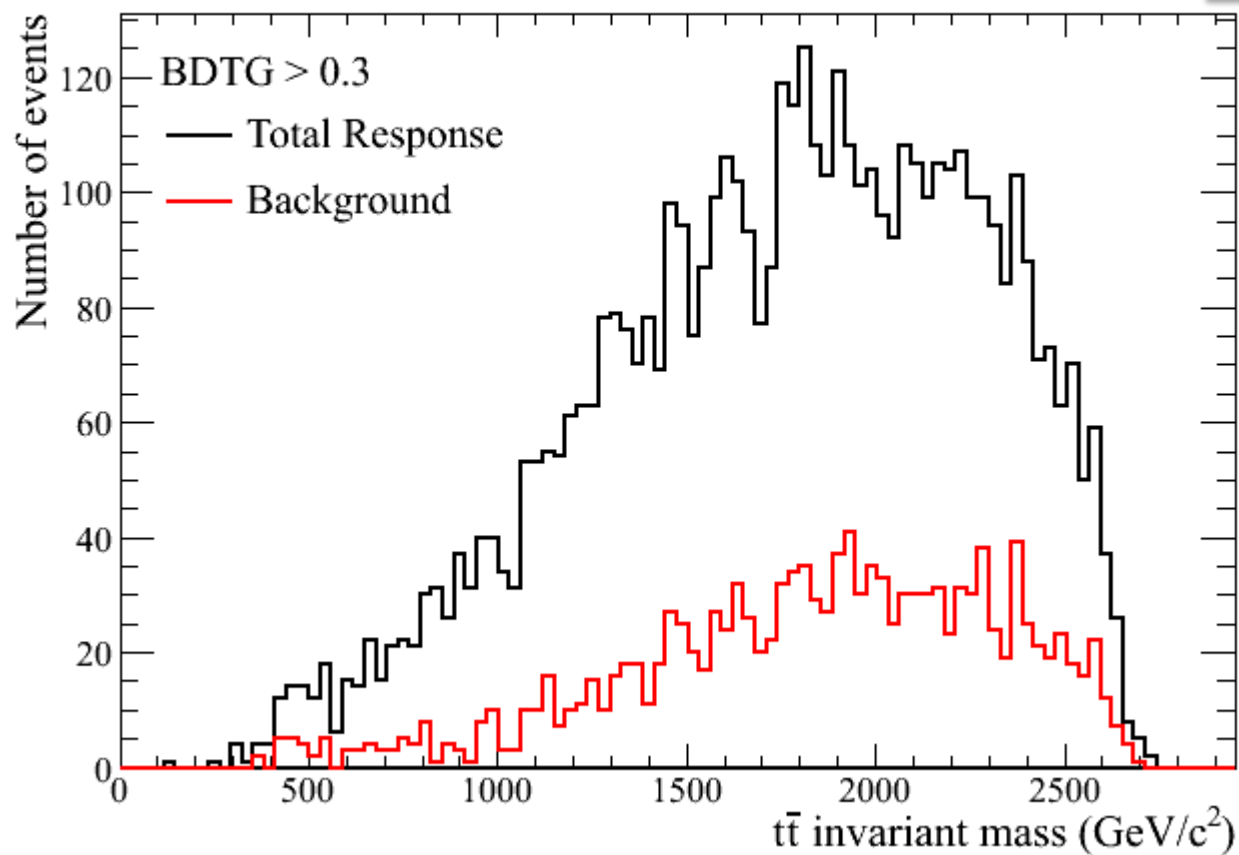
Signal

MZp = 200GeV



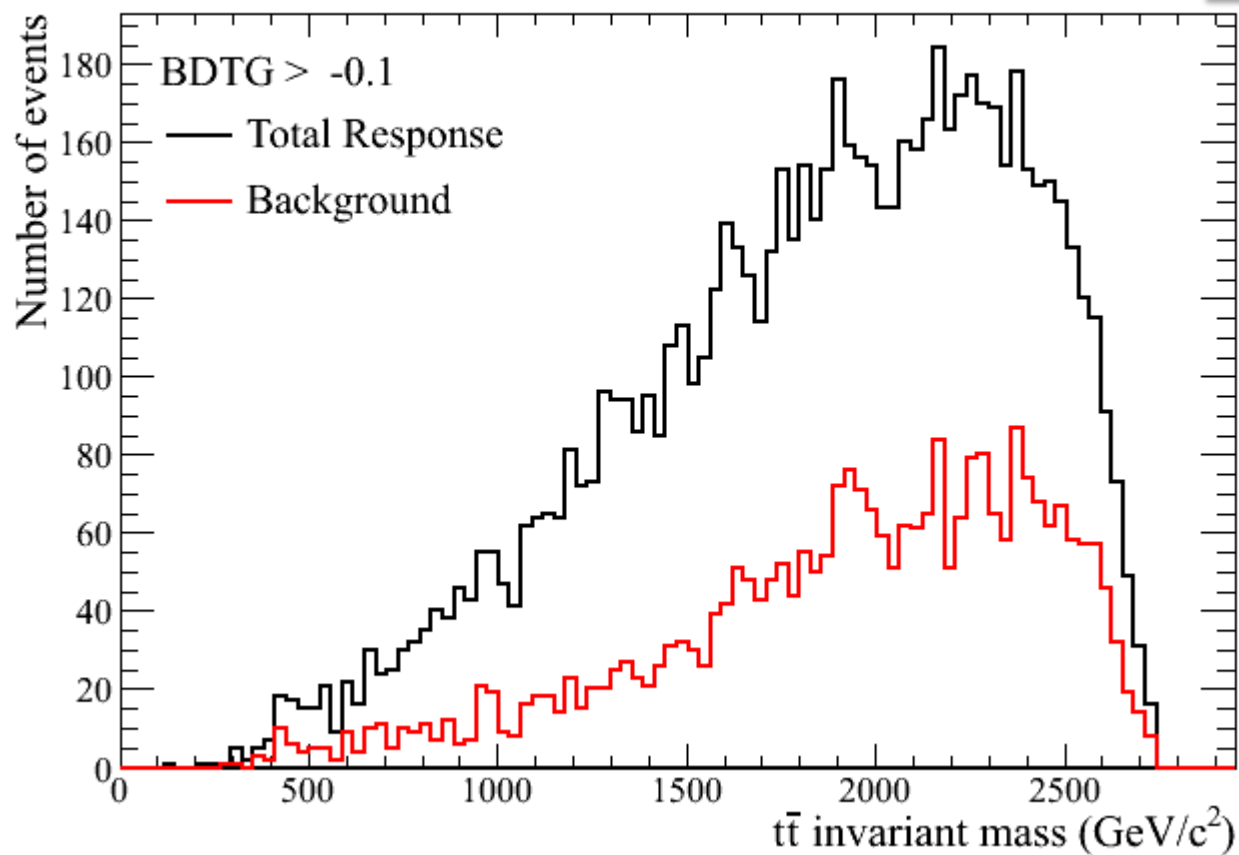
Signal

$M_{Zp} = 200\text{GeV}$



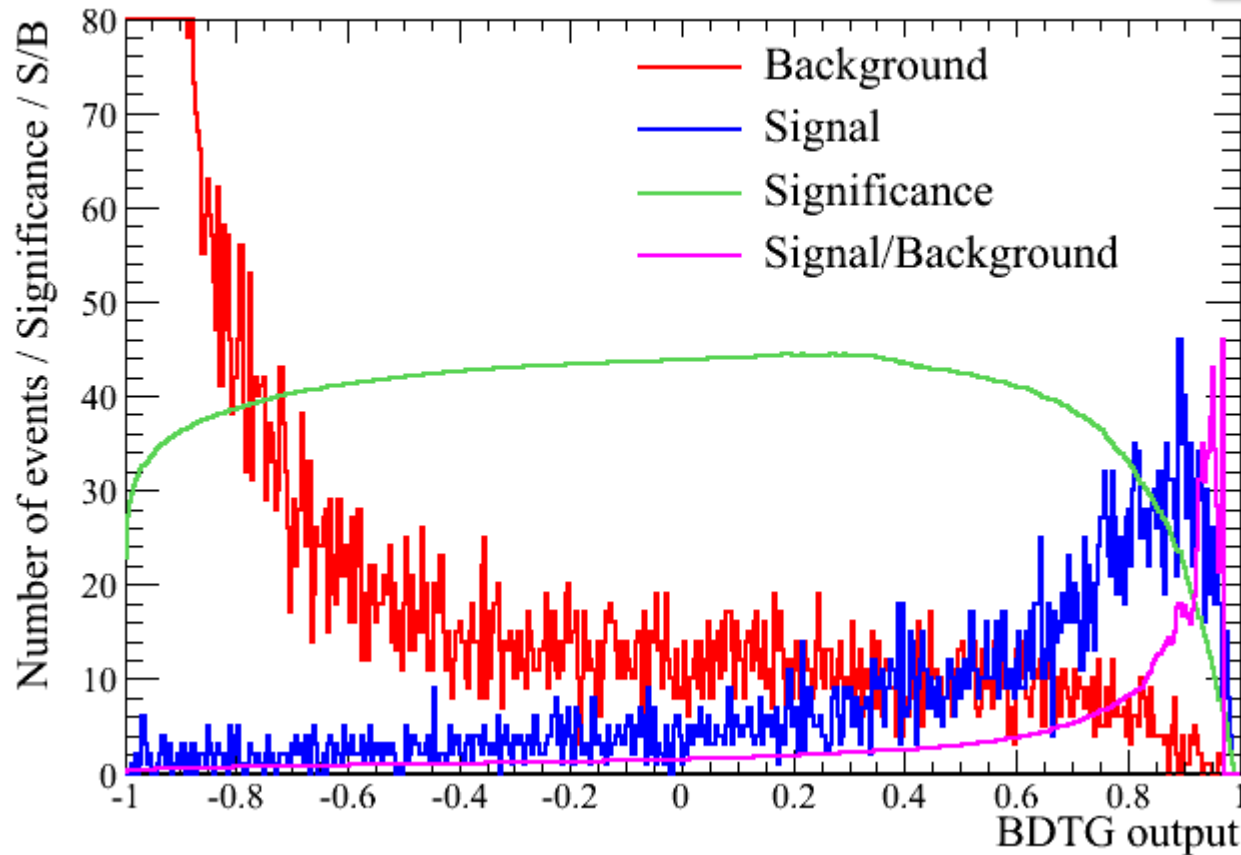
Signal

MZp = 200GeV



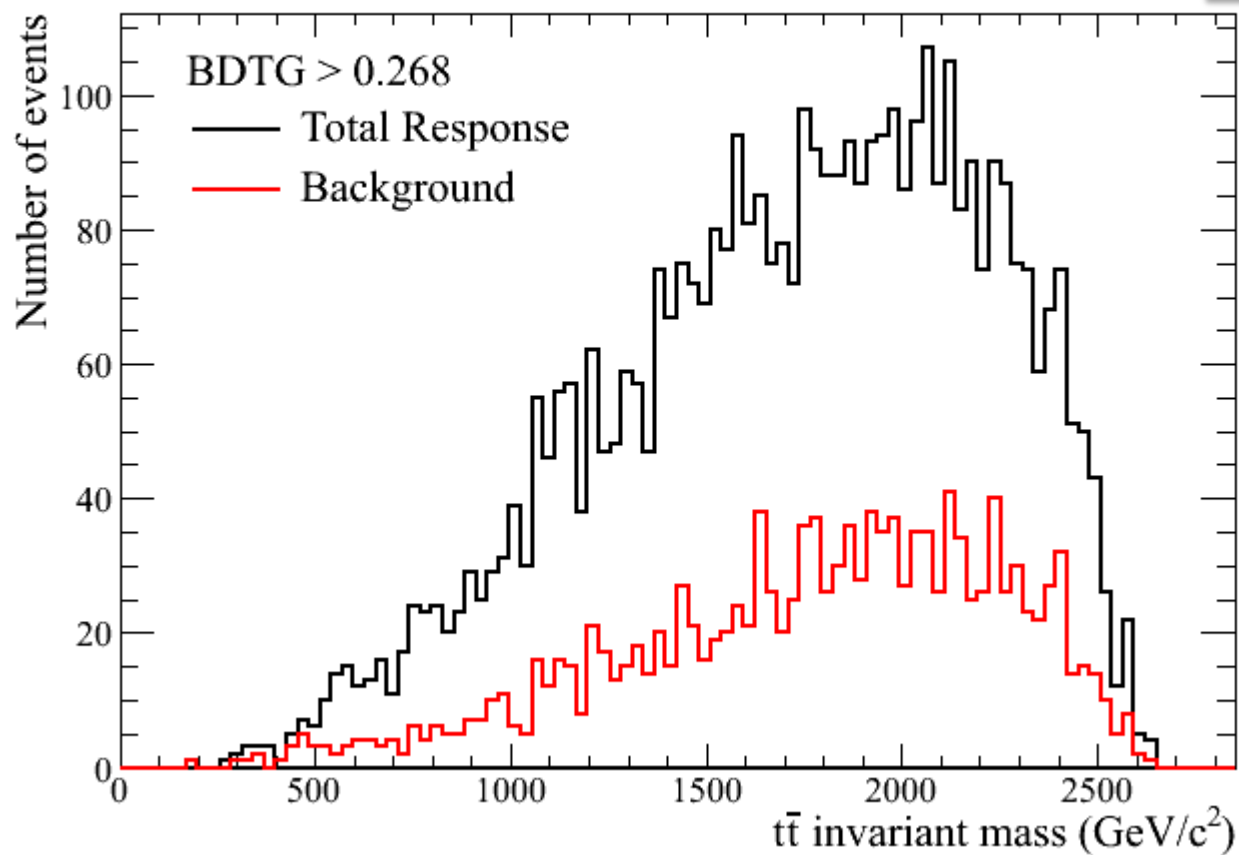
Analysis: classifier output

MZp = 300GeV



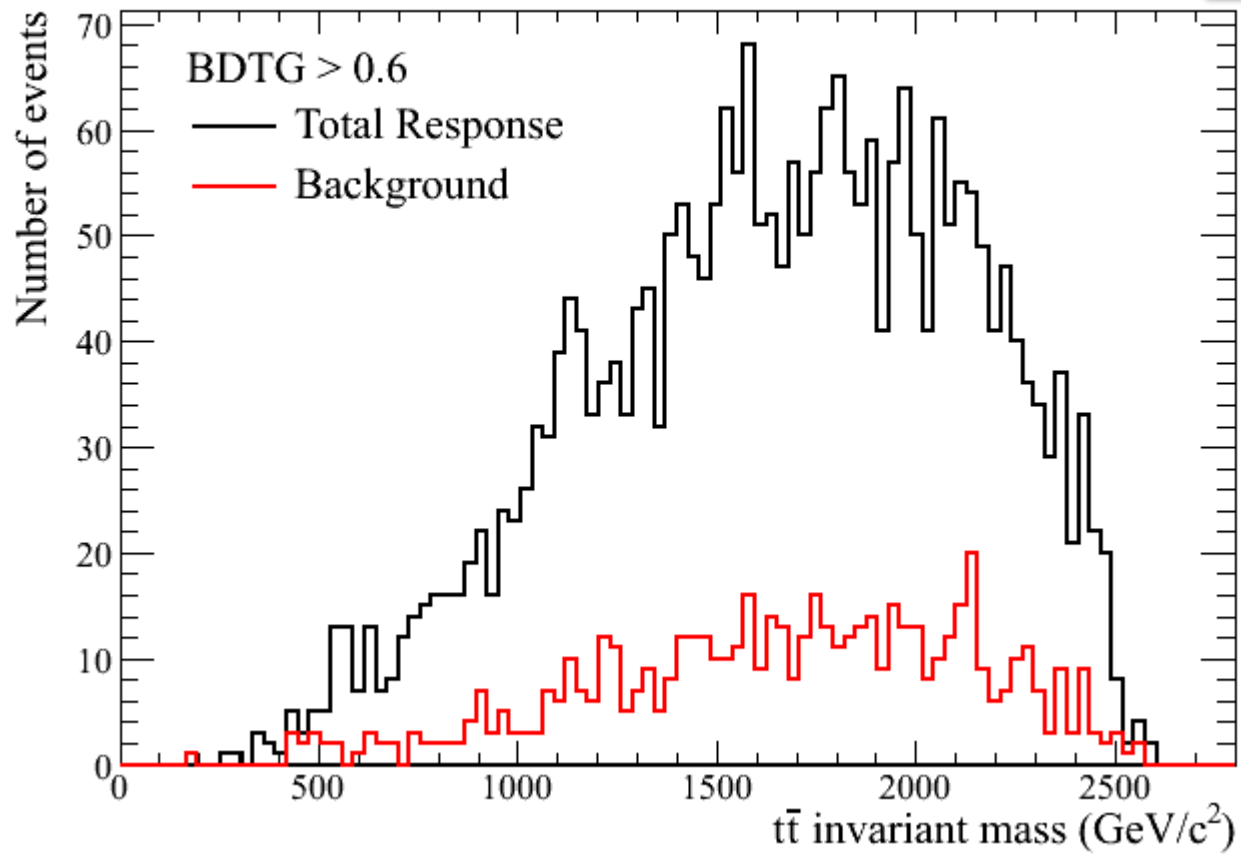
Signal

$M_{Zp} = 300\text{GeV}$

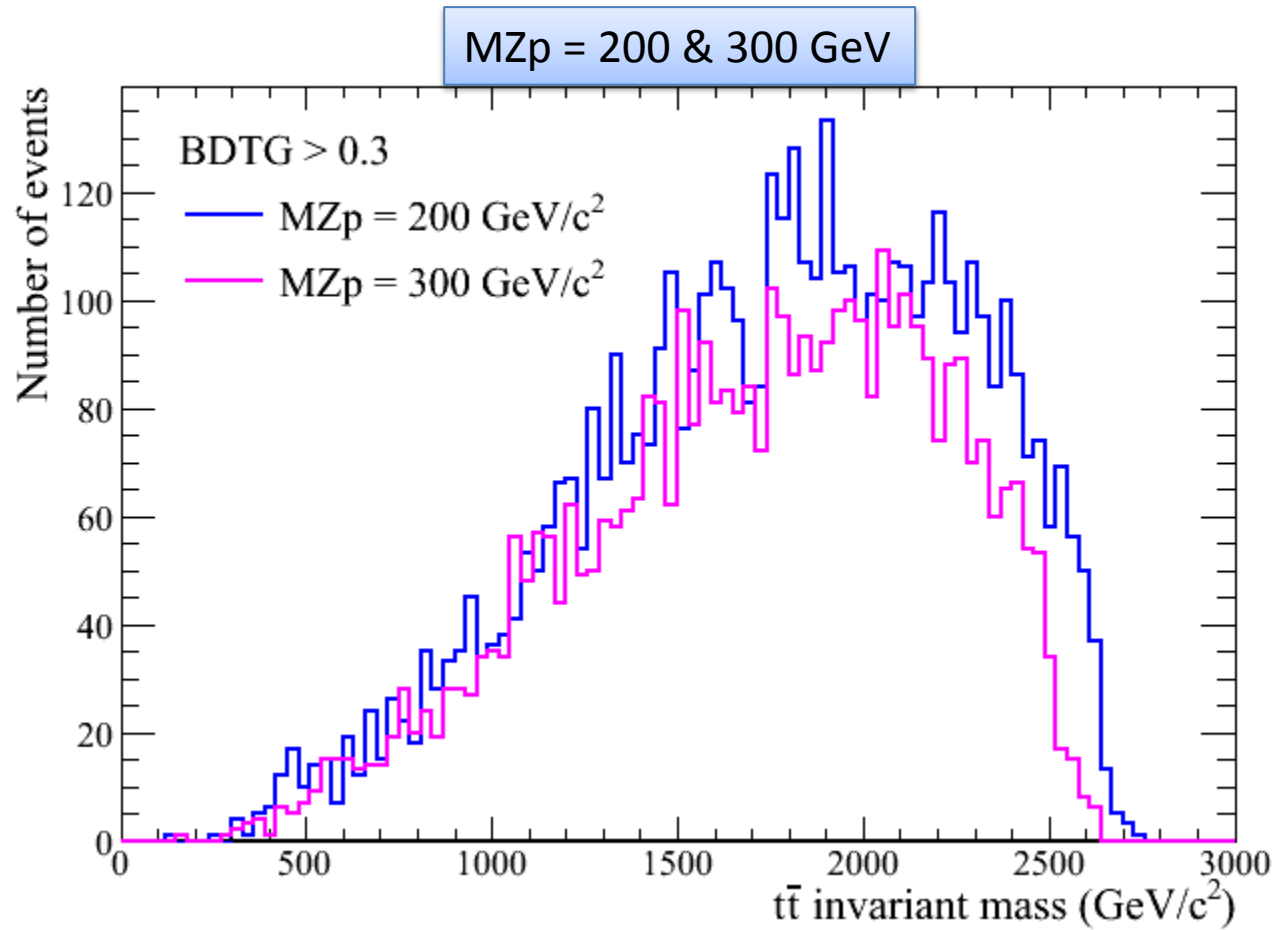


Signal

$M_{Zp} = 300\text{GeV}$



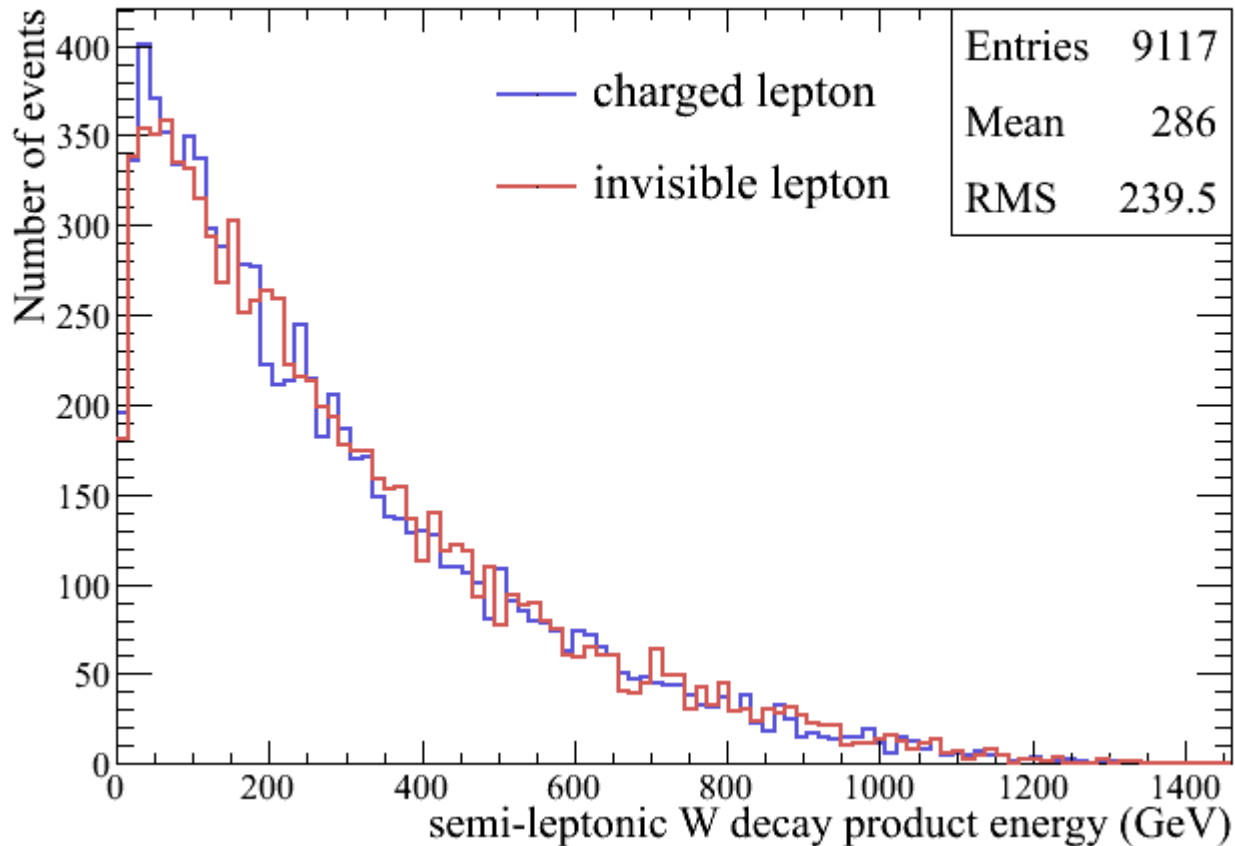
Signal only



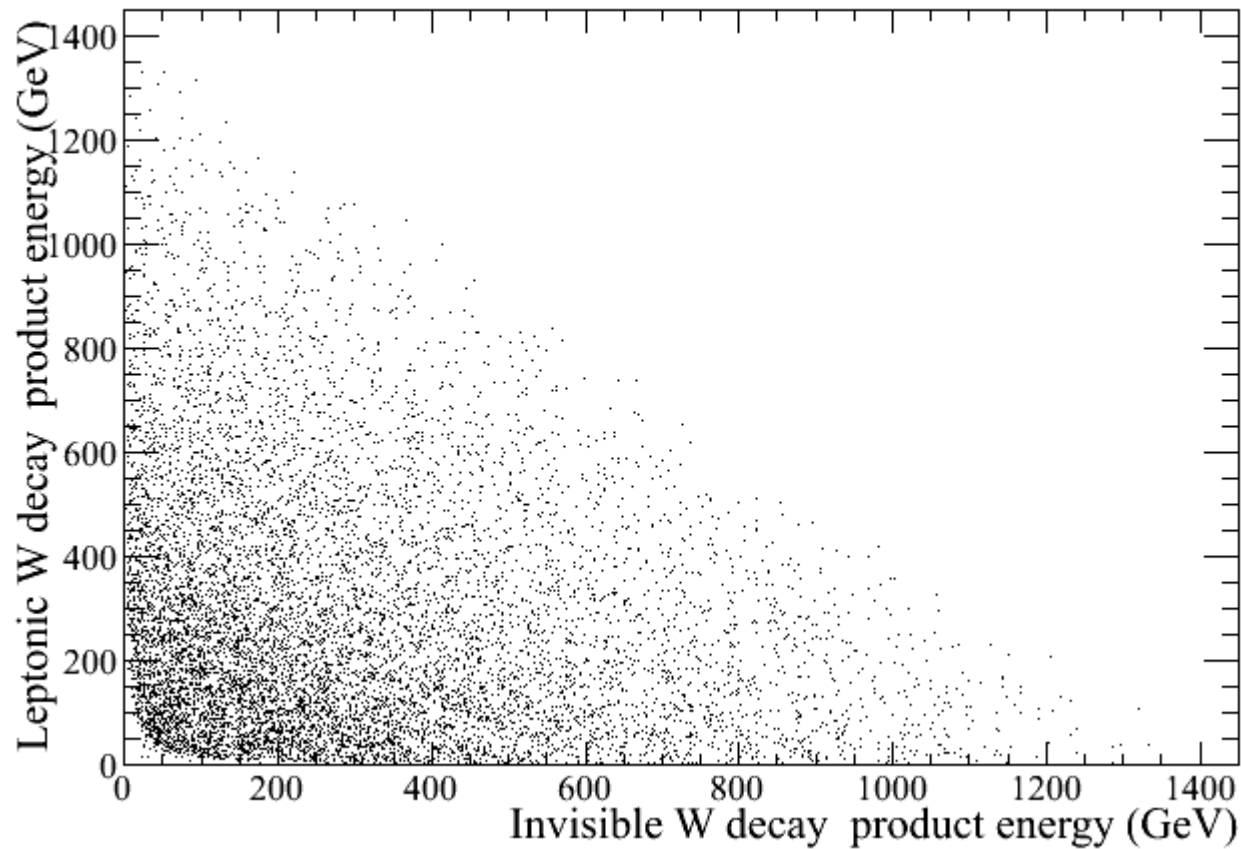
Purifying the samples

- Semi leptonic decays:
 - $W^{+/-}$ ($\sim 30\%$)
 - $B^{+/-}$ ($\sim 10\%$)
 - Lead to high energy leptons and missing energy
- Cut events with such leptons ?
 - Lower the statistics
 - Reduce “irreducible” background ?

Semi-leptonic decays



Semi-leptonic decays



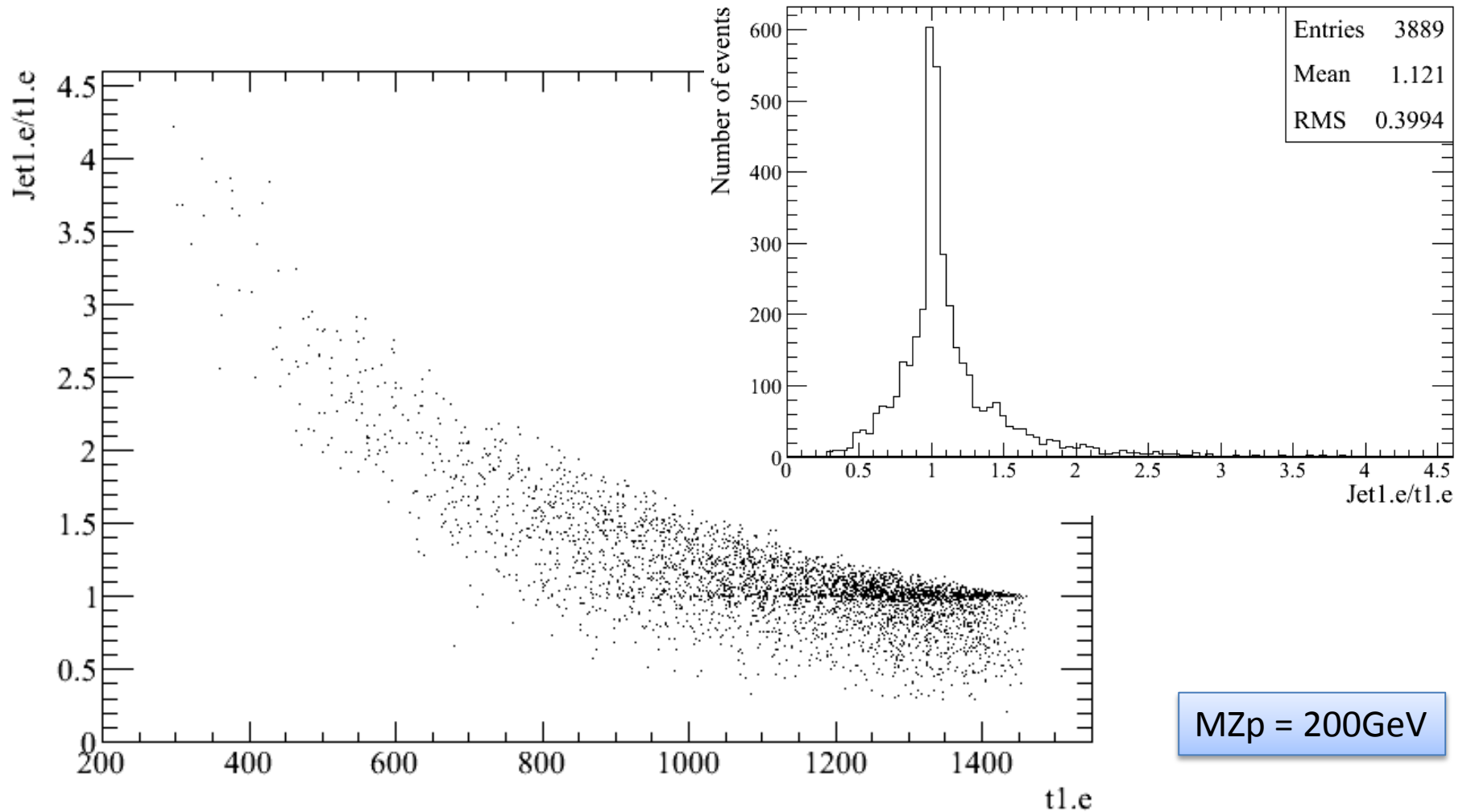
Semi-leptonic decays

- Same argument stands for the b
- b children not saved yet (harder than for W)

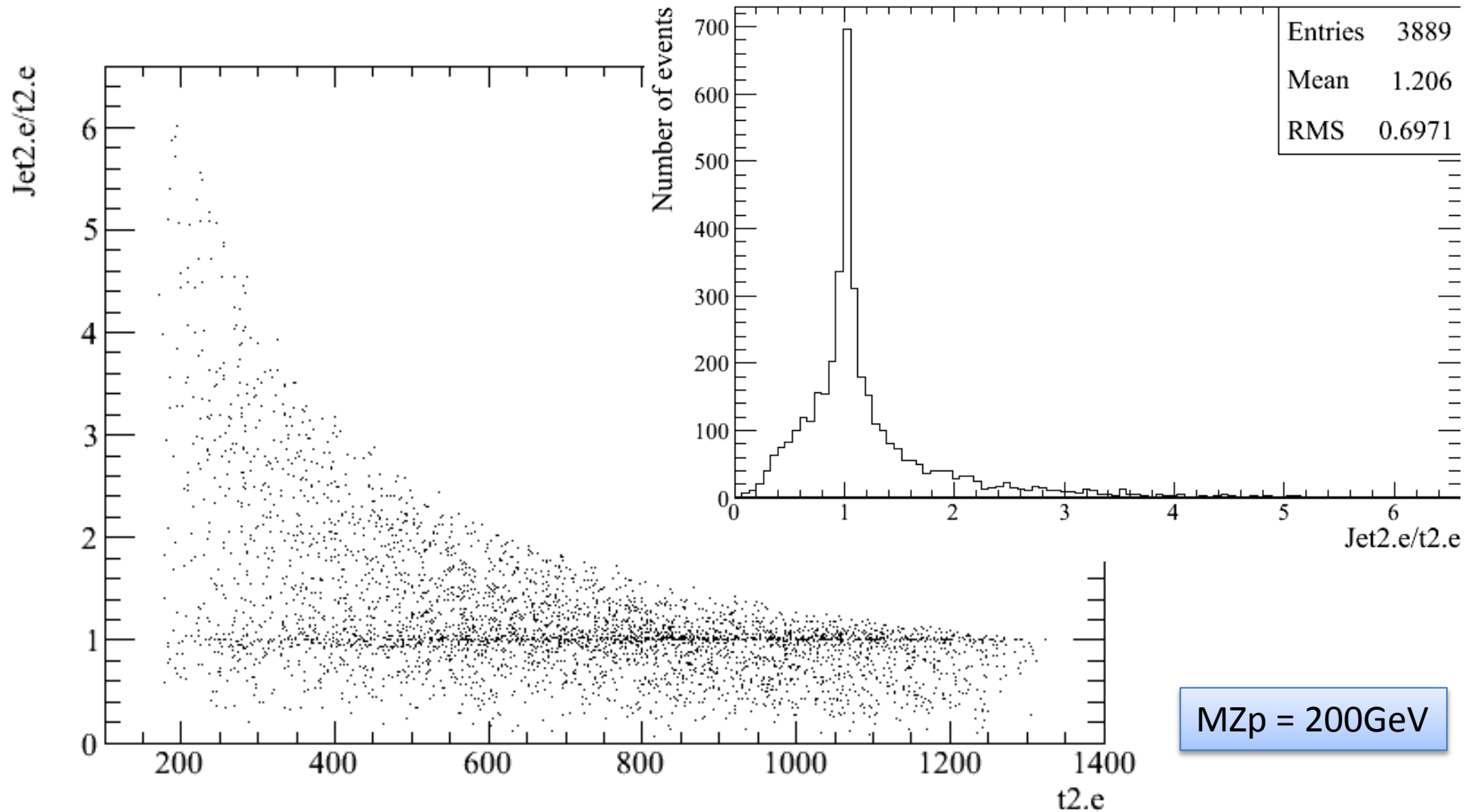
Jet energy resolution

- First glance
- Should discuss the method in details
- Events constrained in 2 jets
- Lund algorithm run on finalstate visible particles
- No detector smearing applied yet

Jet energy resolution



Jet energy resolution



Discussion and outcome