The new multijet trigger for $H + W/Z$

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for

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In this talk:

1. *Old* multijet trigger – and what's wrong with it
2. New multijet trigger basics
3. Run2Trs in action
4. What to do at Level 1?

Next time:

1. Use of tracking information:XFT and SVT
2. b-tagging at Level 3? (SECVTX, JPB, 1 or 2 tags. . .)

Old multijet trigger – and what's wrong with it

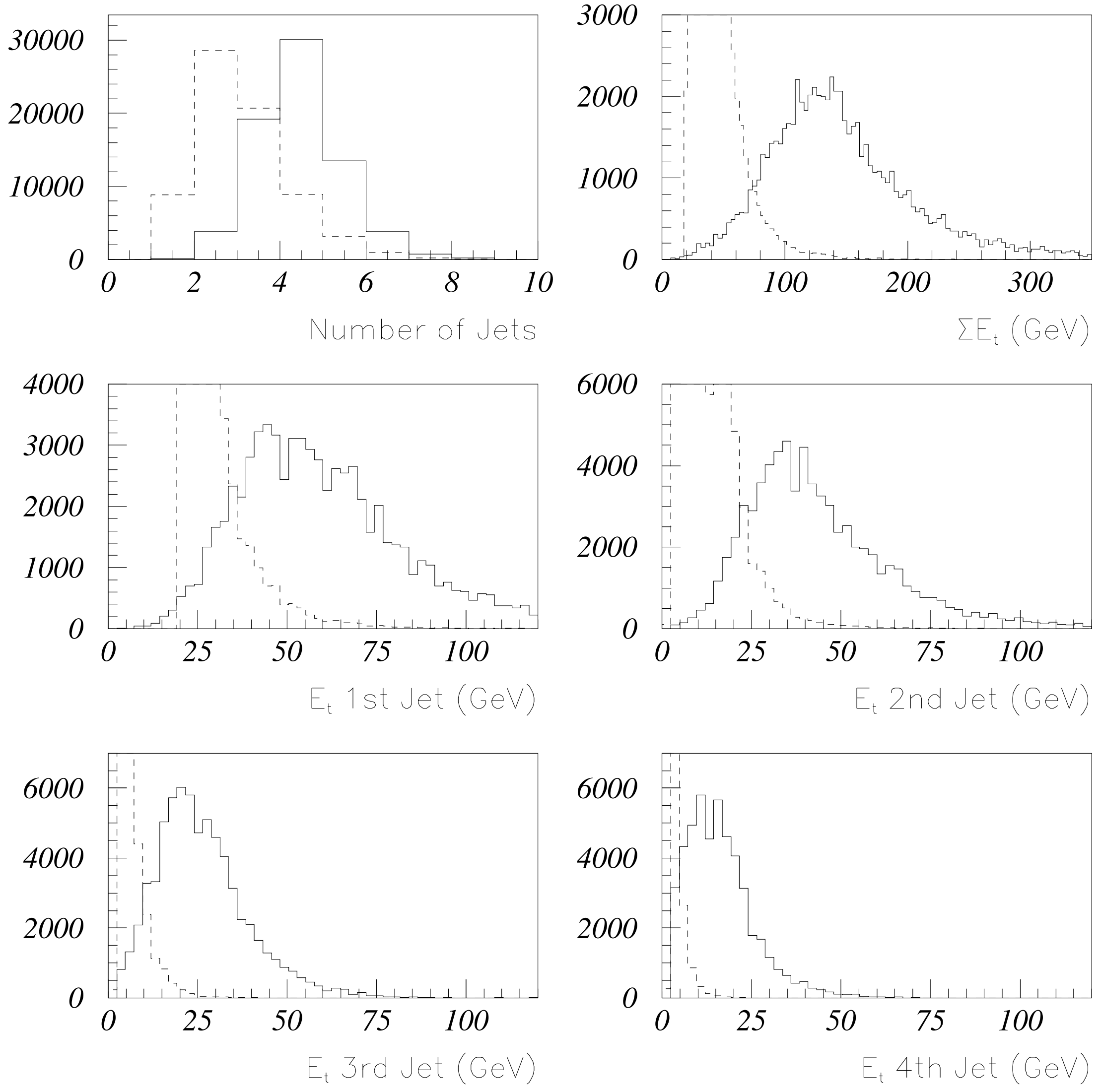
Run I multijet trigger:

- Designed for $t\bar{t} \to 6$ jets
- 4 jets, $E_T > 15$ GeV (10 GeV in Run Ia)
- $\sum E_T > 125$ GeV ($\sum E_T > 100$ in Run Ia)

Problems for Higgs: low efficiency

- $\sum E_T > 125$ is too high
- $N \geq 4$ jets too restrictive (in trigger)

Improving efficiency for $H + W/Z$



New multijet trigger – basics

1. relax number of jets to 3
2. relax $\sum E_T$ cut down to 70 GeV

New multijet trigger – basics

Must cut the rate elsewhere.

New cuts:

1. **at least one displaced track(s) at Level 2**
2. **two b-tags (SECVTX) tags at Level 3**

   (can run offline code at Level 3)

Figures of merit

- **signal efficiency**

  use $H + W/Z$ Pythia Monte Carlo

  ($m_H = 110$ GeV)

- **Level 1, Level 2, Level 3 rates**

  use Jet 20 data

  (since $E_T > 20$ GeV for leading jet)

- $\sigma(\mathrm{Jet20}) = 7.5 \mu b$

L = $10^{32} cm^{-2} s^{-1}$

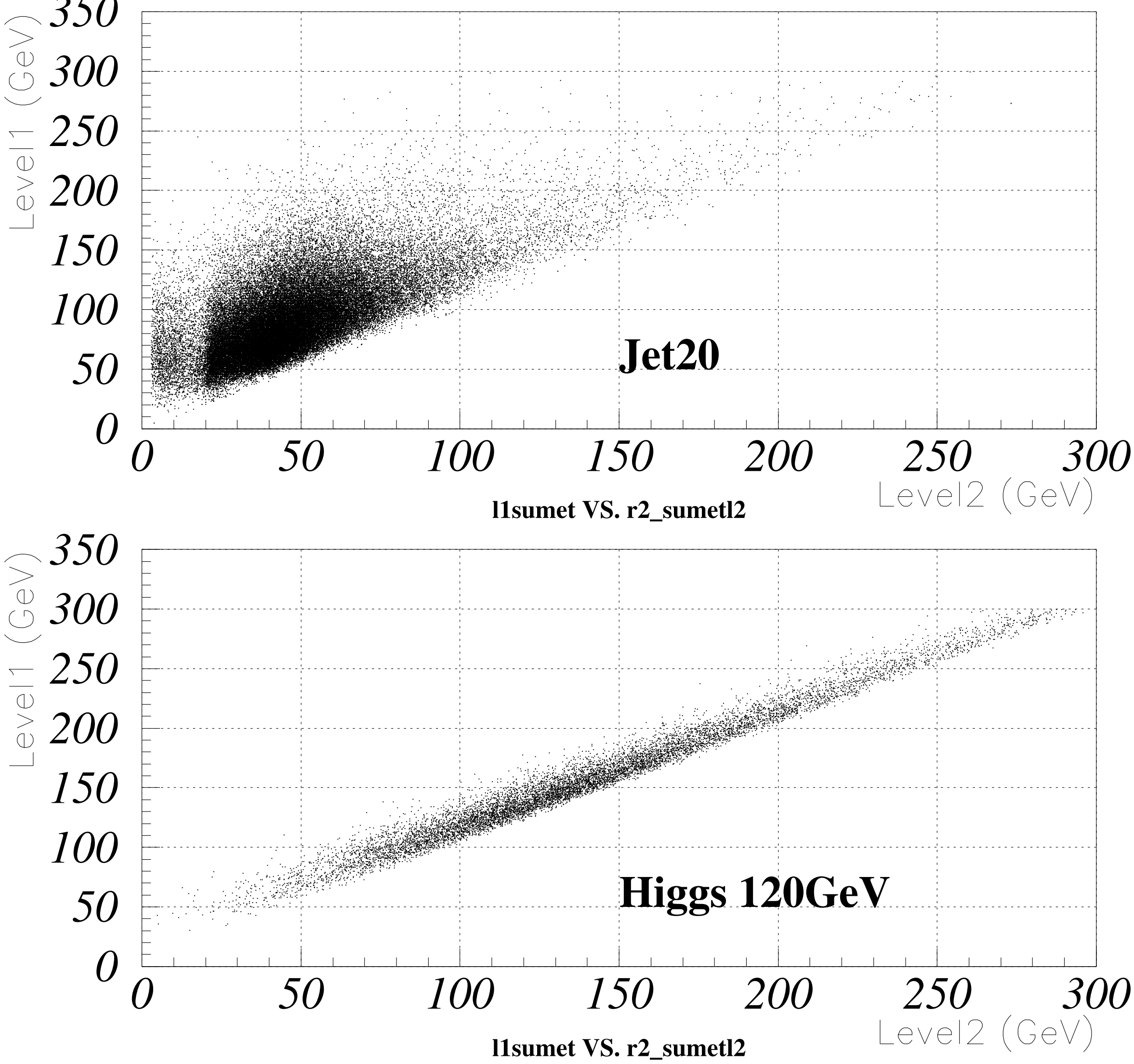
Run2Trs in action

- Previously, we used Run I TRGSIM/TRVIEW, for Higgs MC and used real trigger info from Jet 20
- Now we apply Run2Trs to both

  $\Rightarrow$ some Jet 20 variables are smeared

  (e.g. $E_T(1) > 20$ GeV!)
- Also, now we have Level 1 $\sum E_T$

Level 1 $\sum E_T$ vs. Level 2 $\sum E_T$

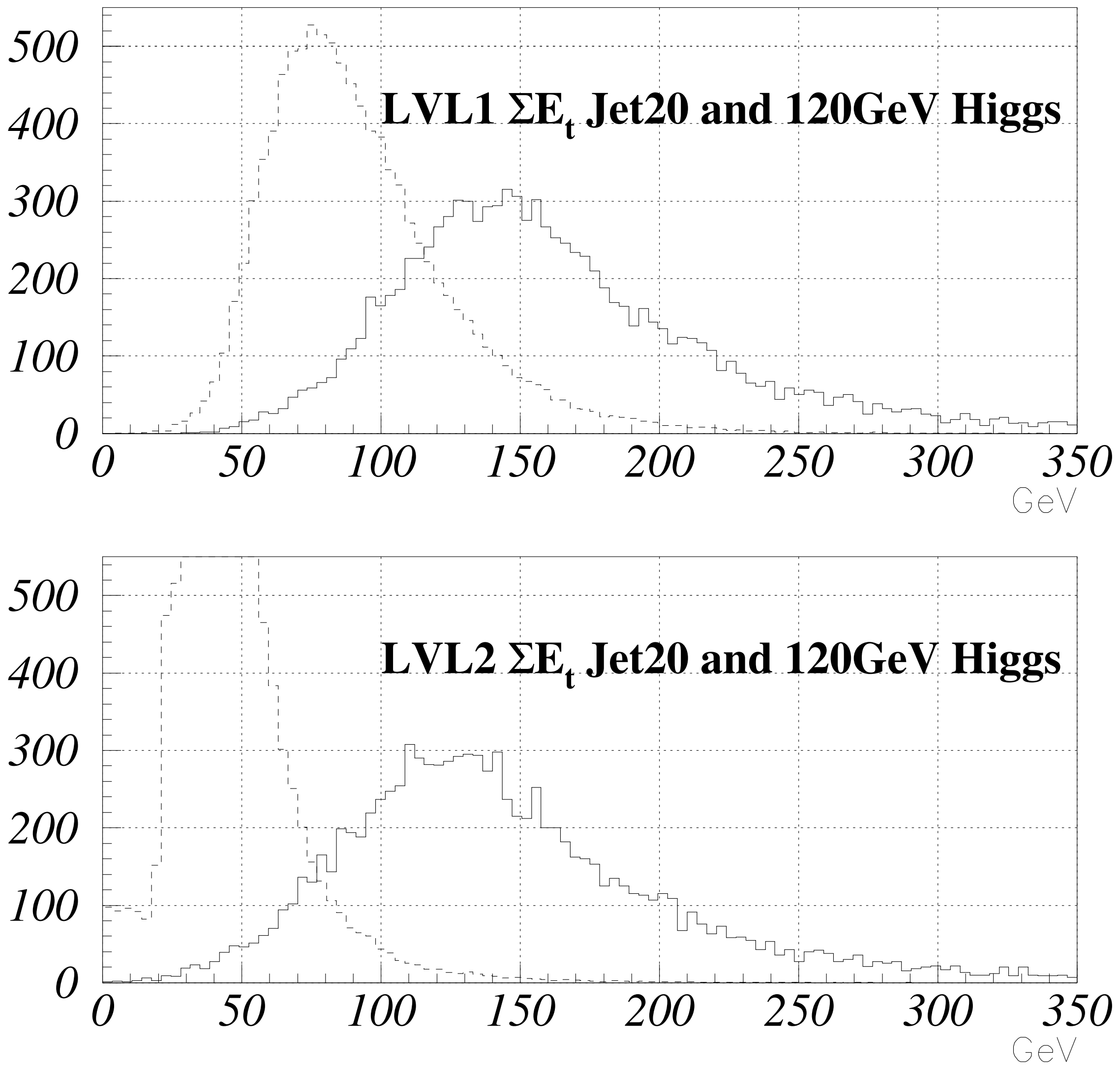


LVL1 ΣE_t vs. LVL2 ΣE_t

Level 1 $\sum E_T$ is smeared in less energetic events

$\Rightarrow$ has less separation power

Level 1 $\sum E_T$ and Level 2 $\sum E_T$



But could it also be that Higgs MC (Pythia) is too optimistic?

Higgs efficiency vs. Level 1 $\sum E_T$