Monotop Update

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August 5, 2016
What is new?

- We have been doing the leptonic and hadronic studies.
- In both cases, we used the cuts of CMS’ experimental studies.
- We implemented $m_T$ top variable.
- We implemented the best combination among the light jets and we reconstructed the invariant mass of bjj system.
### Luminosity and Cross Sections

<table>
<thead>
<tr>
<th>Process</th>
<th>Value [fb]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luminosity</td>
<td>$100 \ fb^{-1}$</td>
</tr>
<tr>
<td>$\sigma$(process)</td>
<td>Value [fb]</td>
</tr>
<tr>
<td>Monotop left-handed 0 jets</td>
<td>36</td>
</tr>
<tr>
<td>Monotop right-handed 0 jets</td>
<td>36</td>
</tr>
<tr>
<td>Monotop left-handed 1 jets</td>
<td>124</td>
</tr>
<tr>
<td>Monotop right-handed 1 jets</td>
<td>124</td>
</tr>
<tr>
<td>Drell- Yan</td>
<td>2240000</td>
</tr>
<tr>
<td>W+ jets</td>
<td>32000000</td>
</tr>
<tr>
<td>Single top</td>
<td>430400</td>
</tr>
<tr>
<td>$t\bar{t}$ semi-leptonic</td>
<td>159400.</td>
</tr>
<tr>
<td>$t\bar{t}$ di-leptonic</td>
<td>26700.</td>
</tr>
</tbody>
</table>
# Event Selection Criteria

<table>
<thead>
<tr>
<th>CMS Selections</th>
</tr>
</thead>
<tbody>
<tr>
<td>$N(b - jet)$ = 1</td>
</tr>
<tr>
<td>$p_T(b - jet)$ &gt; 70 GeV</td>
</tr>
<tr>
<td>$</td>
</tr>
<tr>
<td>No b-jets $p_T$ &gt; 30 GeV</td>
</tr>
<tr>
<td>No b-jets $</td>
</tr>
<tr>
<td>N (No b-jets) = 0</td>
</tr>
<tr>
<td>$N(\ell) \ (\ell = \mu - OR - e)$ = 1</td>
</tr>
<tr>
<td>$p_\ell^T$ &gt; 33 GeV</td>
</tr>
<tr>
<td>$</td>
</tr>
<tr>
<td>N other leptons = 0</td>
</tr>
<tr>
<td>$\vec{p}_T(W)$ &gt; 50 GeV</td>
</tr>
<tr>
<td>$</td>
</tr>
<tr>
<td>Overlaps removal $\Delta R &gt; 0.3$</td>
</tr>
<tr>
<td>$E_T^{miss}$ &gt; 100 GeV</td>
</tr>
<tr>
<td>$m_T$ &gt; 280 GeV</td>
</tr>
</tbody>
</table>
$m_T$ variable for signal and backgrounds

- $m_T$ for muon and electron channels after $E_T^{miss}$ cut.
b-pT ratio - Signal 1 jet

- b-pT ratio for muon and electron channels after $E_T^{miss}$ cut.

**Muon Channel**

**Electron Channel**
\[ \tilde{p}_T(\text{top}) = \tilde{p}_T(b - \text{jet}) + \tilde{p}_T(\ell) \]  \hspace{1cm} (1)

\[ m_T^{\text{top}} = \sqrt{2 \tilde{p}_T^{\text{top}} \cdot \mathcal{E}_T \left[ 1 - \cos \Delta \phi_{\text{top},\mathcal{E}_T} \right]} \]  \hspace{1cm} (2)
\( m_{\top} \) signal 1 jet

- \( m_{\top} \) for muon and electron channels after \( m_T > 280 \text{ GeV} \) cut.
• Hadronic $W+$jets with a MET cut $> 250$ GeV at Generator level.

### CMS Selections

<table>
<thead>
<tr>
<th>Selection</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No b-jets $p_T &gt; 30$ GeV</td>
</tr>
<tr>
<td>2</td>
<td>No b-jets $</td>
</tr>
<tr>
<td>3</td>
<td>$N(b-jet) = 1$</td>
</tr>
<tr>
<td>4</td>
<td>$p_T(b-jet) &gt; 70$ GeV</td>
</tr>
<tr>
<td>5</td>
<td>$</td>
</tr>
<tr>
<td>6</td>
<td>Number (No b-jets) $= 2$</td>
</tr>
<tr>
<td>7</td>
<td>$N(\ell) (\ell = \mu - OR - e - OR - \tau ) = 0$</td>
</tr>
<tr>
<td>8</td>
<td>$E_T^{miss} &gt; 300$ GeV</td>
</tr>
</tbody>
</table>
The invariant mass distributions: No cuts (left) and only one b-jet (right).
The invariant mass distributions: Lepton veto (left) and after $E_T^{miss} > 300$ GeV (right).
- The invariant mass distributions: No cuts (left) and only one b-jet (right).
• The invariant mass distributions: Lepton veto (left) and after $E_T^{\text{miss}} > 300$ GeV (right).