**Event Selection**

We're studying the lepton+jets decay channels of the $t\bar{t}$ system produced in pp collision at the LHC recorded with the ATLAS detector. The analysis is performed separately for the electron and muon decay channel. The following selection has been performed:

- Only 1 isolated lepton of $E_T > 250\text{GeV}$ (el) or $p_T > 200\text{GeV}$ (mu)
- $E_T^{miss} > 30\text{GeV}$ (el) or $\left( E_T^{miss} + M_T(W) \right) > 600\text{GeV}$ (mu)
- At least 4 jets with $p_T > 25\text{GeV}$
- At least 1 b-jet

**Background**

Fake leptons: from non prompt leptons (both $e$ and $\mu$ channel), photon conversion and mis-identified jets ($c$ channel). It is estimated from the data using the so called “matrix method”[3] based on a “loose” and a “tight” lepton selection. 

$W$+jets: shape evaluated from MC simulation while absolute normalization from the data using the asymmetry in the production of $W^+$ and $W^-$ (charge asymmetry method[4]).

The other main background sources are ($Z$-jets, $WW/WZ/ZZ$, single top) and are evaluated from MC simulation.

**Data/MC comparison**

Agreement within 10% for kinematic jet and electron distributions that guarantee a good jets modeling.

**Unfolding**

In high-energy physics measurements of physical observables are typically distorted by detector effects:

\[ \text{obs} = A_{(\text{rec, true})} \times \text{phys} \]

This makes direct comparison with theoretical predictions and other experiments impossible. A general approach is to unfold the experimental results accounting for resolution and acceptance effects contained in the response matrix $A(c,t)$ evaluated from MC simulation. We are studying some different unfolding methods like bin by bin, SVD, iterative bayesian and simple matrix inversion, used for the results shown below.

**Template Overlap [2]**

This method compares the calorimetric clusters $(c)$ that constitute jets in the observed events with a set of simulated particles from boosted decay, called templates $(t)$.

If we introduce a functional $F(c,t)$ that quantifies how well the energy flow of $(c)$ matches $(t)$ then the maximum functional overlap of $(c)$ with respect to $(t)$ will be

\[ \Omega_t(c) = \max_c F(c,t) \]

The results shown beside have been obtained with simulated top and QCD bllg sample from 2 different MC generators, comparing in $F(c,t)$ only the energy of clusters and templates[2].

I'm starting to search for new physics in ATLAS using samples of $t\bar{t}$ events.

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