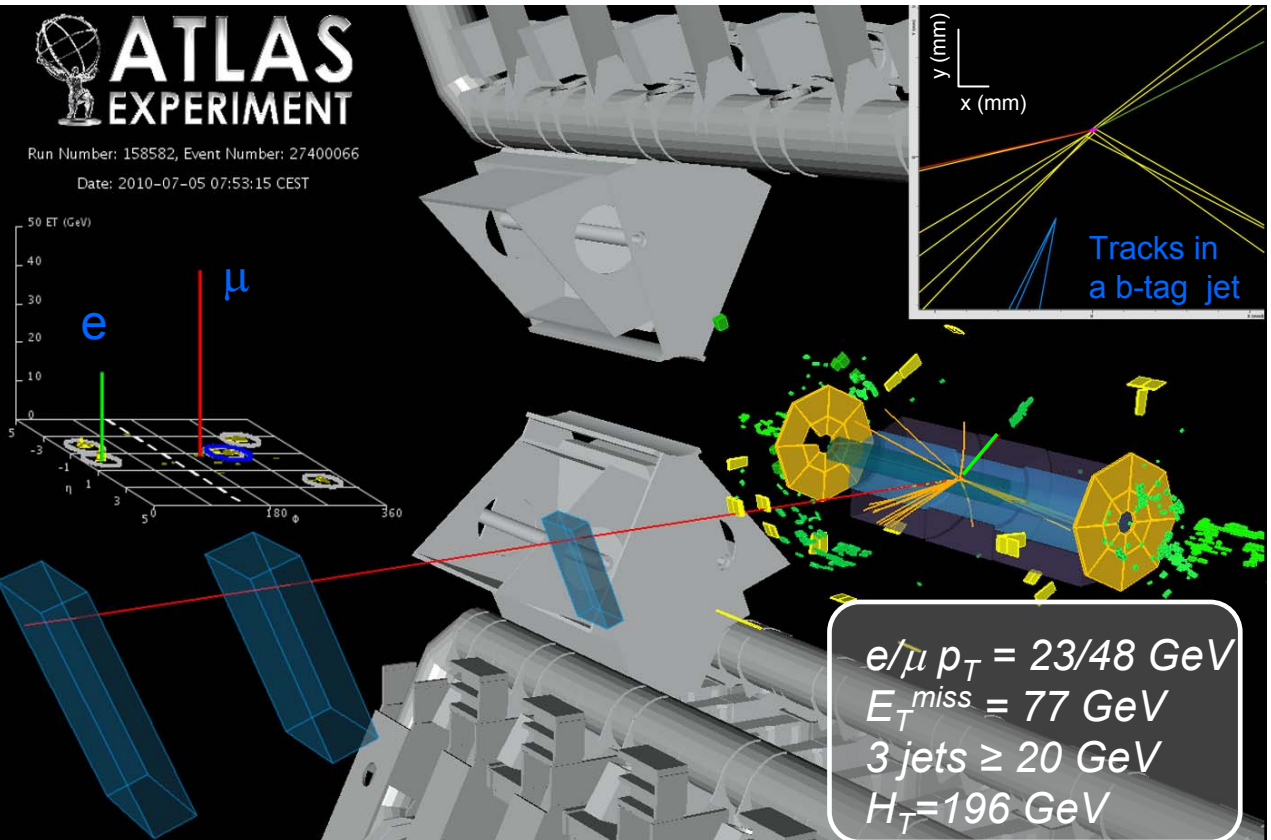
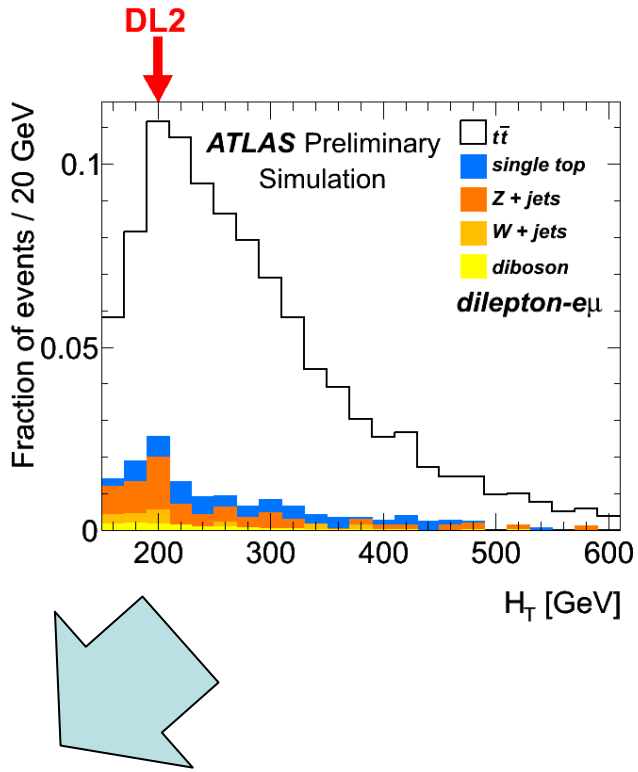
Top quarks

Already at the end of May, we started observing events like this:

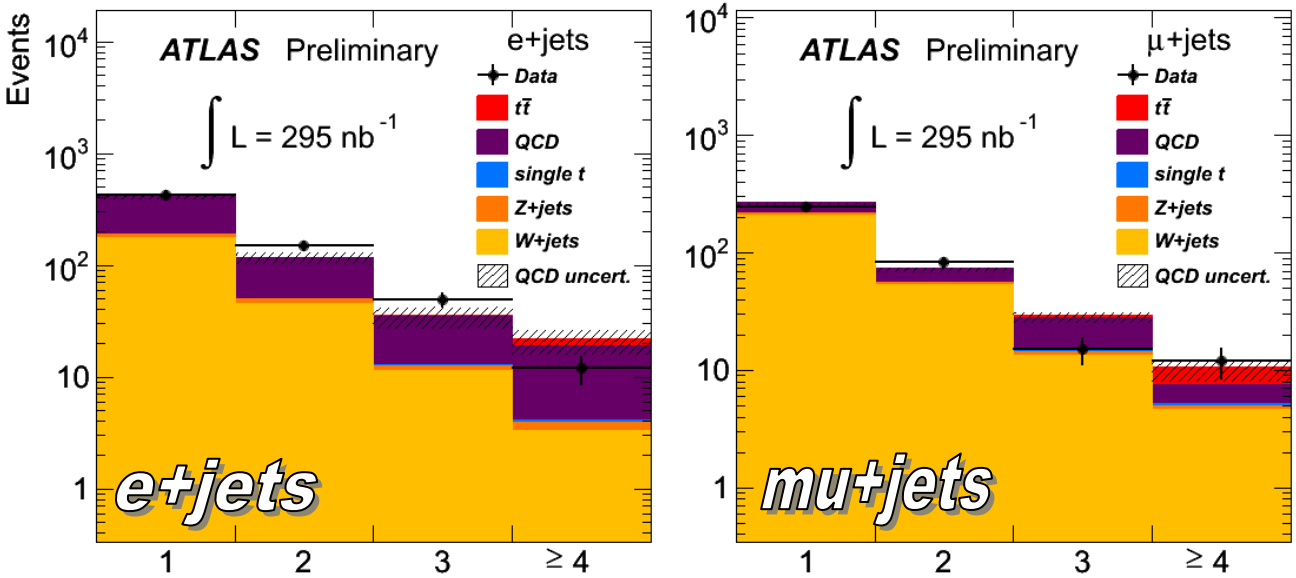
- a rich final state:
- exploring the complete dector capabilities:
  - many jets (some from b-quarks)
  - high p_T, isolated charged lepton(s)
  - missing E_T, E_T^{miss}

Event Display of a e/μ dilepton top candidate

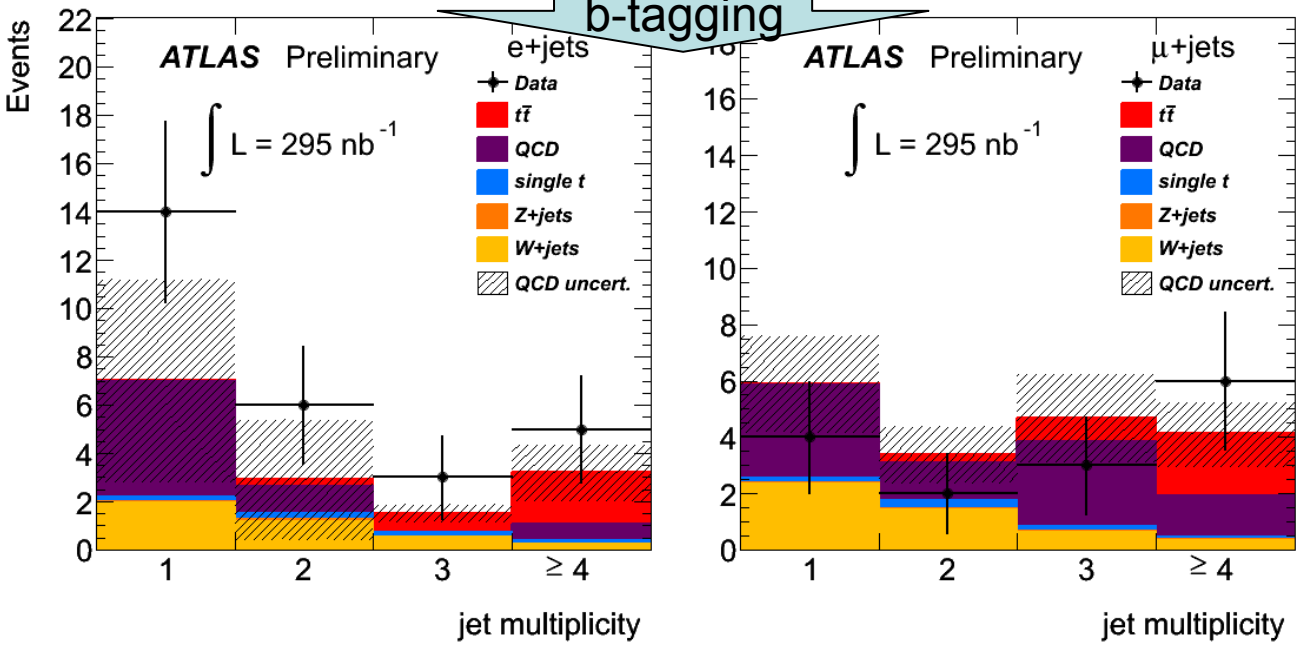




Backgrounds to top, l+jets channel



b-tagging

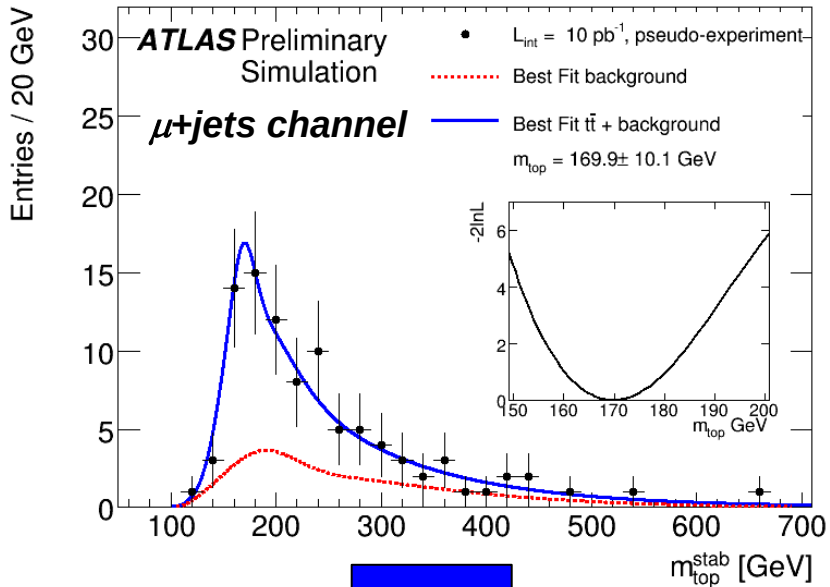


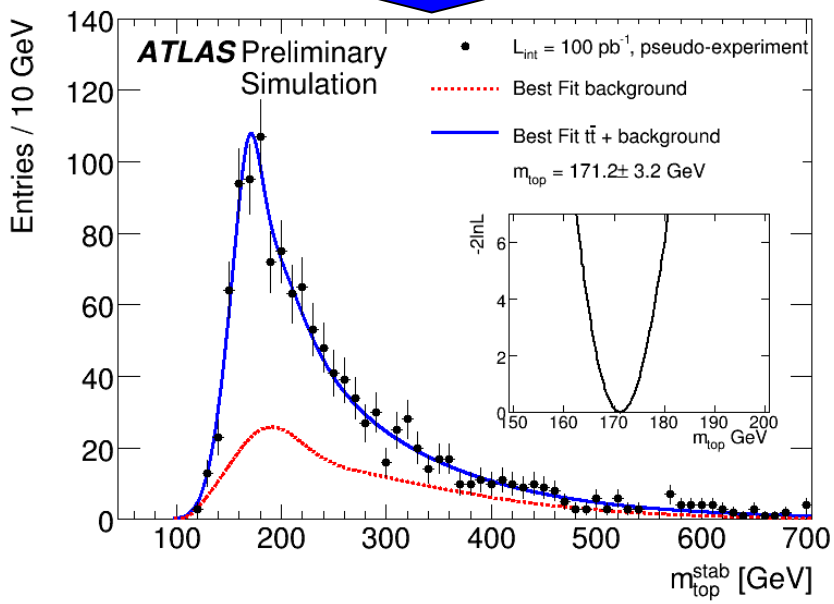
The QCD background here is data-driven (these plots use the matrix method).

The single top and W/Z+jets backgrounds are taken from Monte Carlo: MC@NLO and ALPGEN

Despite the low statistics, after b-tagging requirements, the agreement between data and MC is remarkable and top signal starts to appear according to the expectations in the high jet multiplicity bins

Prospects for m_{top} @ 10 TeV: 1-D template





►stabilized m_{top}: $m_{\mathrm{top}}^{\mathrm{stab}} \equiv \frac{m_{\mathrm{top}}^{\mathrm{reco}}}{m_{W}^{\mathrm{reco}}} \cdot m_{W}$

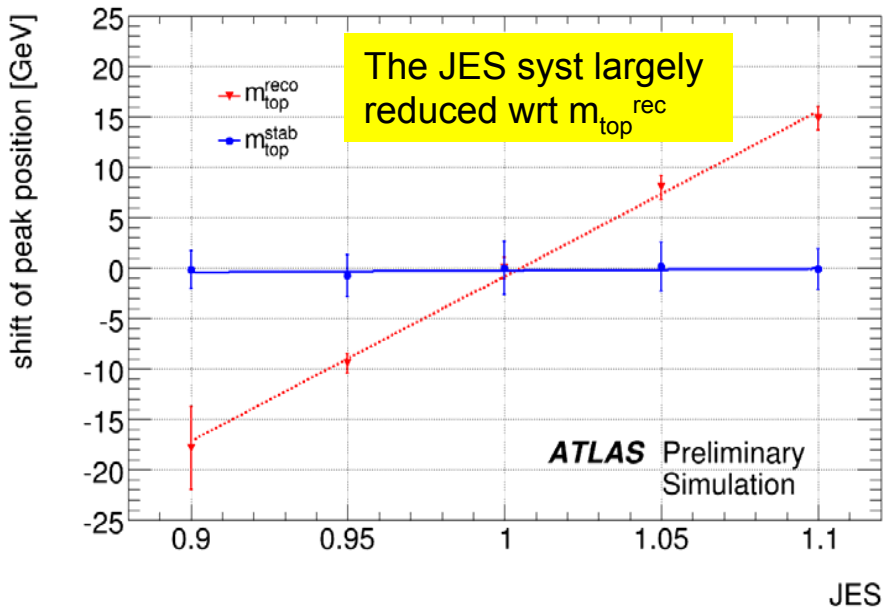
►assuming SM background fractions(S/B~1.4)

►input m_{top}=172.5

Statistical uncertainty [GeV] as a function of $\mathscr{L}_{\mathrm{int}}$			
	$10\ \mathrm{pb}^{-1}$	$30\ \mathrm{pb}^{-1}$	$100\ \mathrm{pb}^{-1}$
Electron channel	10.8 ± 3.5	7.0 ± 2.1	2.7 ± 1.3
Muon channel	9.9 ± 3.9	5.8 ± 1.5	2.8 ± 0.8

at 7 TeV stat. unc. ~ 50% larger

1-D: $\Delta m_{top}(\sqrt{s}=10\mathrm{TeV}, L=100\mathrm{pb}^{-1})$~ ±2 (stat) ± 4(syst) GeV

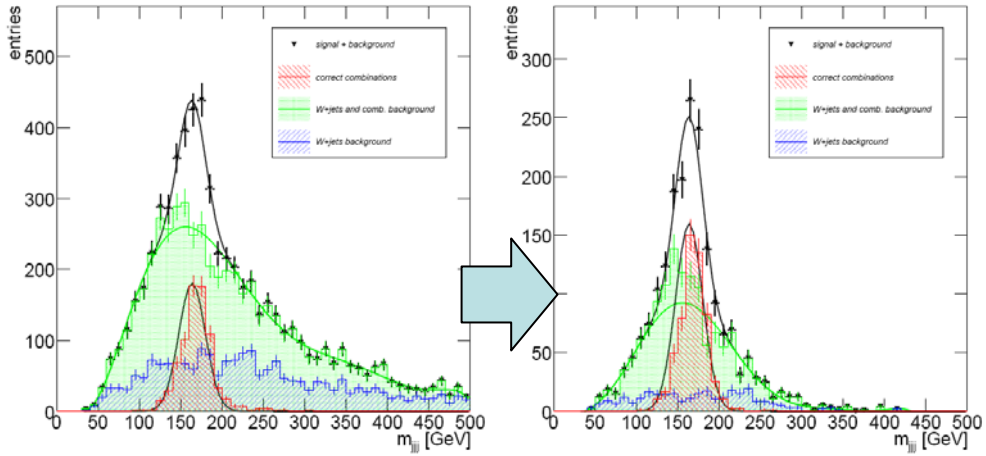


Improving on the top reconstruction

- Significant improvement of S/N by a multivariate analysis (Fisher discriminant) based on 7 kinematic observables. (T.Goettfert PhD thesis)

Standard reconstruction

With multivariate analysis



- Significant improved in the reconstruction of the 3-jet combination from the hadronic top quark candidate by using a constrained kinematical fit (P.Weigell, Diploma thesis)