Summary of top quark activities in ATLAS France

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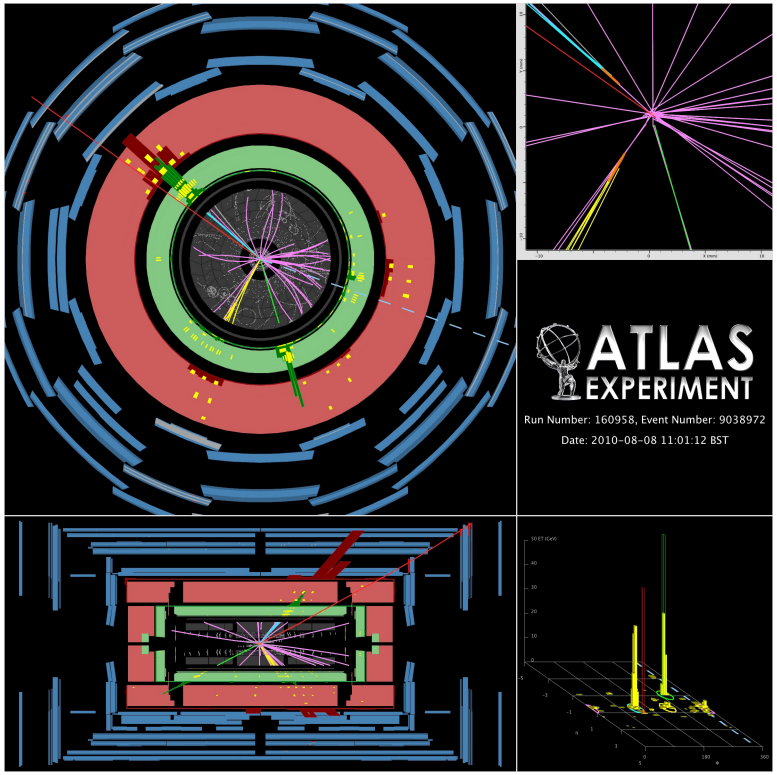
Journées de discussion sur la physique du quark top dans ATLAS et CMS en France, 21-22 mars 2013, Lyon



introduction
top quark pair production
  cross section
  polarization and spin correlation
electroweak production
  single top cross section
top mass measurements
exotic searches

backup slides : see detailed information for each lab

ATLAS detector & French lab responsibilities

Muon spectrometer (|η|<2.7) : air-cores toroids with gas-based chambers. Trigger and measurement. Momentum resolution <10% up to Eμ~1 TeV
IRFU

Inner Detector (|η|<2.5) : Si pixel (***CPPM***), SCT, TRT, Tracking and vertexing. e/π separation

$\sigma(p_T)/p_T \sim 0.038\%\ p_T\ (\text{GeV}) \oplus 1.5\%$

Upgrade : CPPM, LPNHE

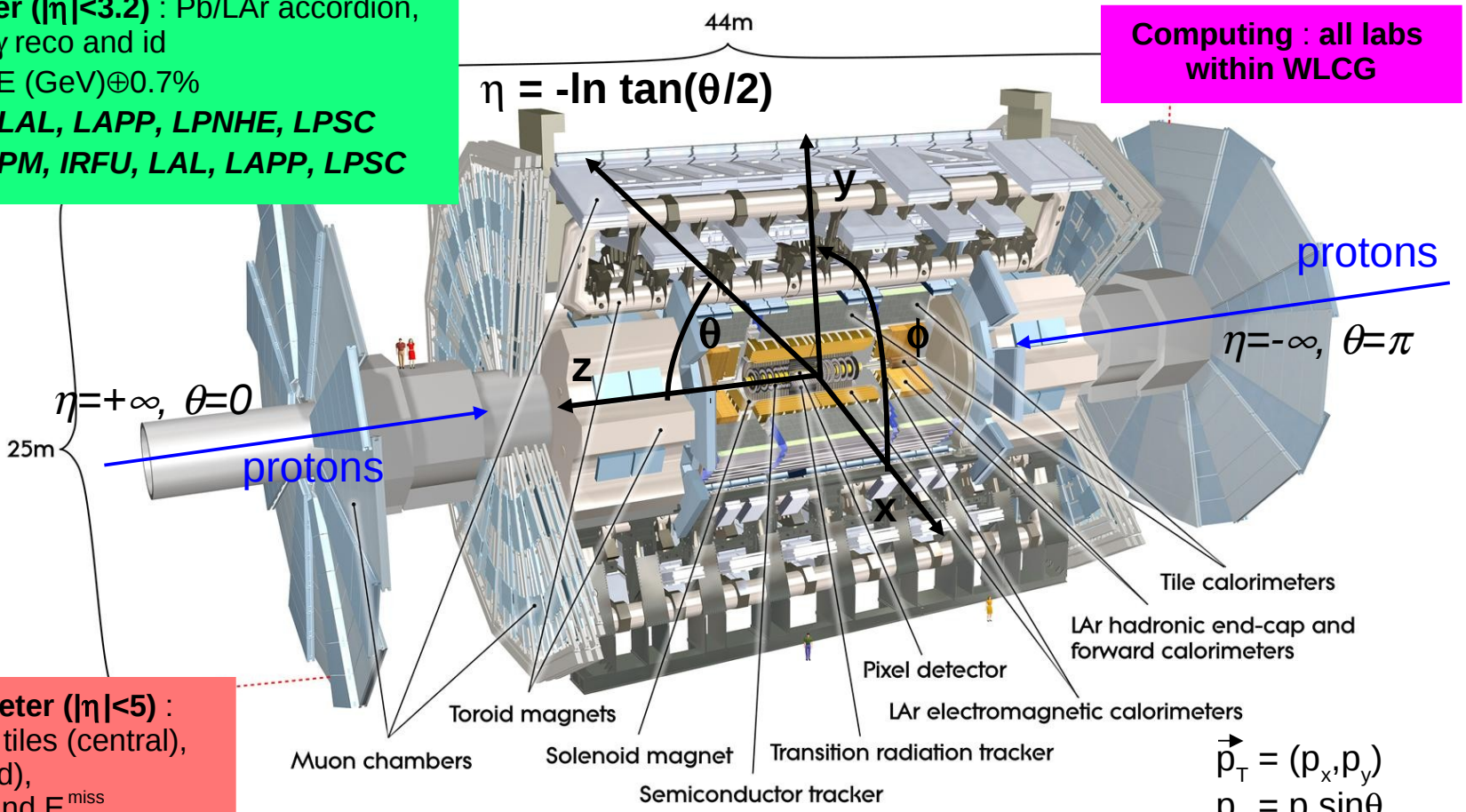
EM calorimeter (|η|<3.2) : Pb/LAr accordion, Trigger and e/γ reco and id

$\sigma(E)/E \sim 10\%/\sqrt{E}\ (\text{GeV}) \oplus 0.7\%$

CPPM, IRFU, LAL, LAPP, LPNHE, LPSC

Upgrade : CPPM, IRFU, LAL, LAPP, LPSC

Computing : **all labs within WLCG**



HAD calorimeter (|η|<5) : Fe/scintillator tiles (central), Cu/W LAr (fwd), Trigger, jets and E_T^{miss}

$\sigma(E)/E \sim 50\%/\sqrt{E}\ (\text{GeV}) \oplus 3\%$

LPC

$\vec{p}_T = (p_x, p_y)$

$p_T = p \sin\theta$

$E_T = E \sin\theta$

Trigger : (**IRFU, LPNHE**)
L1 : hardware, L2-EF, ~200 Hz in output

Object reconstruction and French top activities

All labs have been and are still involved in definition of objects for top analyses and combined performance

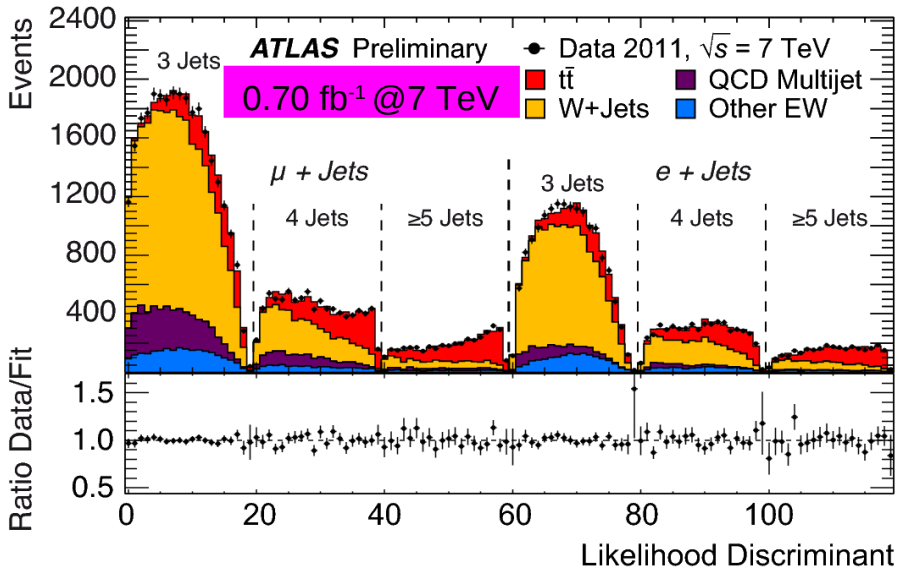
- **Trigger (IRFU, LPNHE)**
  - single lepton high p_T
  - N jets, possible from b-quark
- **Electron (CPPM, IRFU, LAPP, LPNHE)**
  - EM cluster and track matched
  - isolation in tracker and calo
  - E_T>25 GeV, |η|<2.5
- **Muon (IRFU)**
  - tracks in ID and muon spectrometer
  - isolation in tracker and calo
  - p_T>25 GeV, |η|<2.5
- **Tau (CPPM)**
  - calo cluster + 1 or 3 tracks
  - identification using a BDT
  - 20<p_T<100 GeV, |η|<2.3
- **Jet (LPC, LPNHE)**
  - reconstructed from topological clusters using anti-kT (R=0.4) algorithm
  - p_T>25 GeV, |η|<2.5
- **b-tagging (CPPM, IRFU, LPSC)**
  - Neural Network based algorithm with average b-tagging efficiency ~70 % and light jet rejection factor ~140
- **E_T^{miss} (LAL)**
  - vector sum of energy deposits in calo
  - corrected for identified objects
- **MC generator (IRFU)**

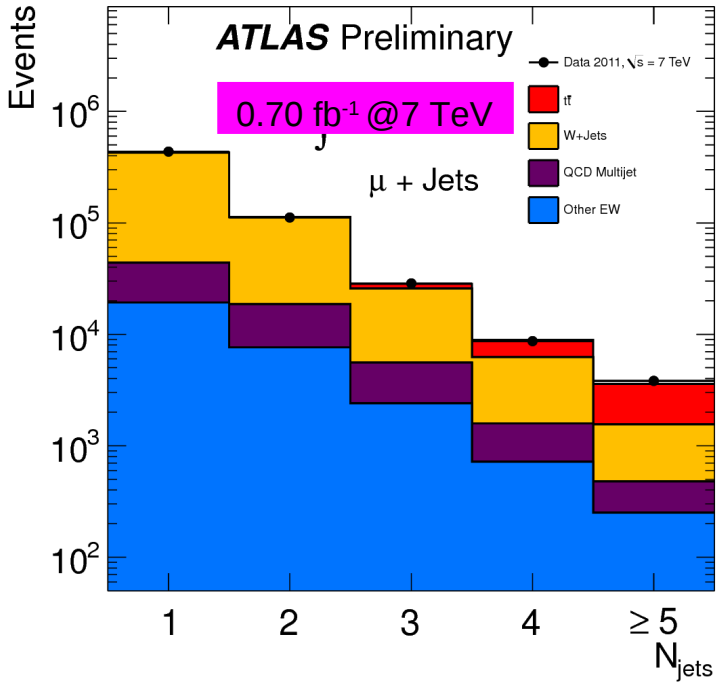
pair production : cross section in lepton + jets

- **Event Selection**
  - 1 isolated e/μ + E_T^{miss} + jets (1b)
- **Analysis strategy**
  - multivariate discriminant based on η_l,$p_{T,lead\ jet}$,Aplanarity,$H_{T,3p}$
  - data driven estimation of Z+j and QCD background. W+j normalized to data

contributions from IRFU

EPJC 71 (2011) 1577 (2.9 pb^{-1} with 2010 data)
ATLAS-CONF-2011-121 (0.7 fb^{-1} with 2011 data)





overall precision ~6.5%

σ_{tt} = 179.0 ± 3.9 (stat) ± 9.0 (syst) ± 6.6 (lumi) pb

Systematic uncertainties :
generator (5.4 pb),
muon (4.1 pb), lumi (6.6 pb)

All labs contributed to 1st measurement on 2010 data from combined performance studies

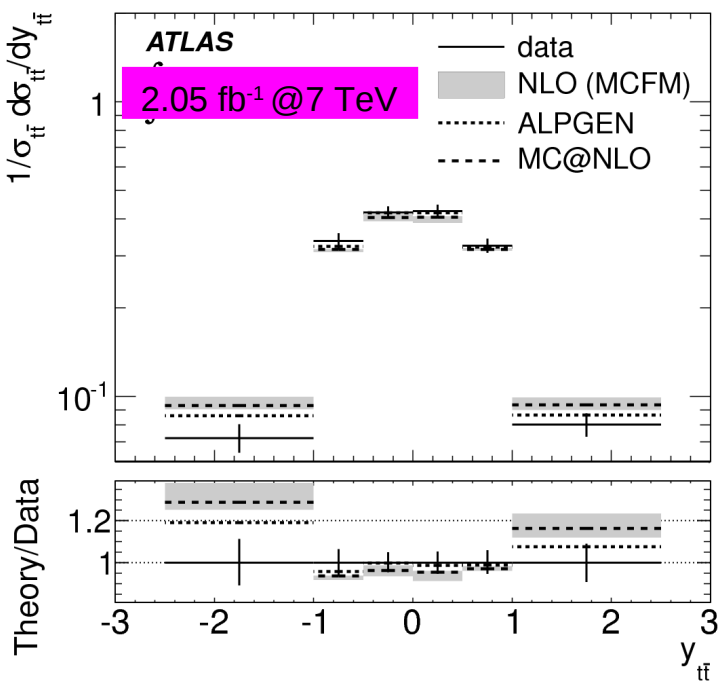
pair production : differential cross section l+ jets

contributions from CPPM

- **Aim**
  - measuring the cross-section as a function of the properties of the top pair system is a stringent test on the Standard Model prediction
- **Event Selection**
  - 1 isolated e/μ + E_T^{miss} + jets (1b)
  - similar to the total cross section measurement
- **Analysis strategy**
  - likelihood determinant based on the masses of the particles in the system, probabilities for the given kinematics and b-tagging probability.
  - use migration matrices to unfold the results to truth particle level

cross-section is measured as a function of observables sensitive to QCD predictions: m, p_T, y of $t\bar{t}$ system

EPJC (2013) 73: 2261



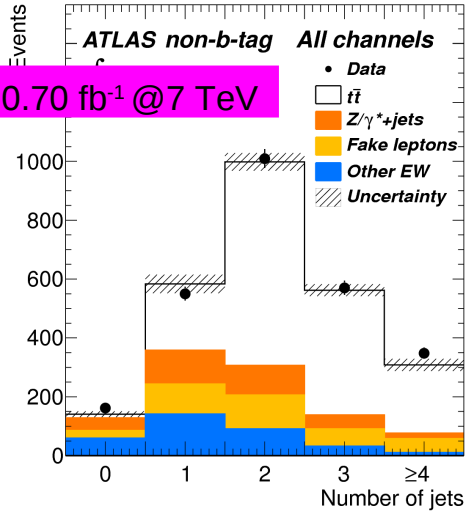
Systematic uncertainties :
driven by those on jet kinematics and generator uncertainties

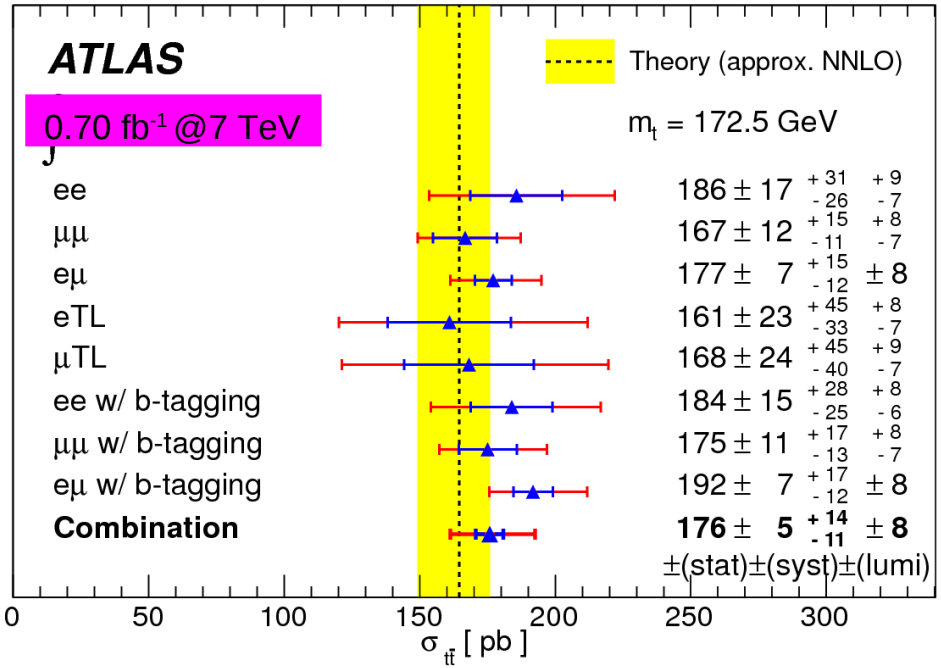
pair production : cross section in dilepton

contributions from LPNHE

- **Event Selection**
  - 2 isolated e/μ + E_T^{miss}+ jets (1b)
  - trigger : 1 single isolated lepton
  - offline : ≥2 jets, opposite sign leptons + E_T^{miss}>30 GeV, ΣE_T(e,μ,jet), Z veto
- **Analysis strategy**
  - counting experiment on 8 channels
  - data driven estimation of Z+j and QCD background. W+j normalized to data

JHEP1205 (2012) 059





$\sigma_{tt} = 176 \pm 5\ (stat)\ ^{+14}_{-11}\ (syst) \pm 8\ (lumi)$ pb

overall precision ~9%

Systematic uncertainties :
in eμ : Jet/E_T^{miss} (~4 pb), generator (~4.5 pb), fake lepton (~3 pb)

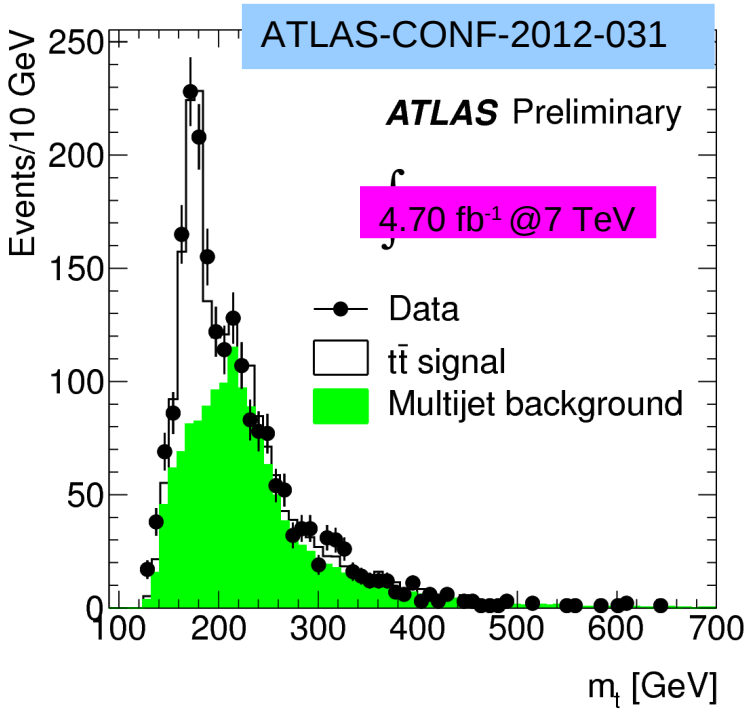
update with 4.7 fb^{-1} in CERN-THESIS-2012-114
$\sigma_{tt} = 178.8 \pm 2.3\ (stat)\ ^{+8.9}_{-8.4}$ (syst) ± 8 (lumi) pb

pair production : cross section in fully hadronic

contributions from CPPM, LPC, ongoing from LPNHE

- **Event Selection**
  - trigger : 5 jets with p_T>30 GeV
  - offline : ≥ 5 jets with p_T>55 GeV,
    ≥ 2 b-jets with ΔR_{bb}>1.2
    6th jet with p_T>30 GeV, jets well separated
  - $E_T^{miss}/\Sigma E_T^{jet}$<3, no isolated lepton with p_T>20 GeV
    ⇒ tt signal efficiency ~0.7 %
- **Analysis strategy**
  - kinematical likelihood fit to find correct association of jets to reconstructed m_t
  - data driven estimation of background
    35% signal and 65% multijet by the pre-btagged sample in the data
  - unbinned likelihood fit to m_t
    - m_t>125 GeV, 6≤N_{jet}≤10
    - χ^2 for m_t and m_W is calculated and satisfy χ^2<30

$$\chi^2 = \frac{(m_{j_1,j_2} - m_W)^2}{\sigma_W^2} + \frac{(m_{j_1,j_2,b_1} - m_t)^2}{\sigma_t^2} + \frac{(m_{j_3,j_4} - m_W)^2}{\sigma_W^2} + \frac{(m_{j_3,j_4,b_2} - m_t)^2}{\sigma_t^2}$$



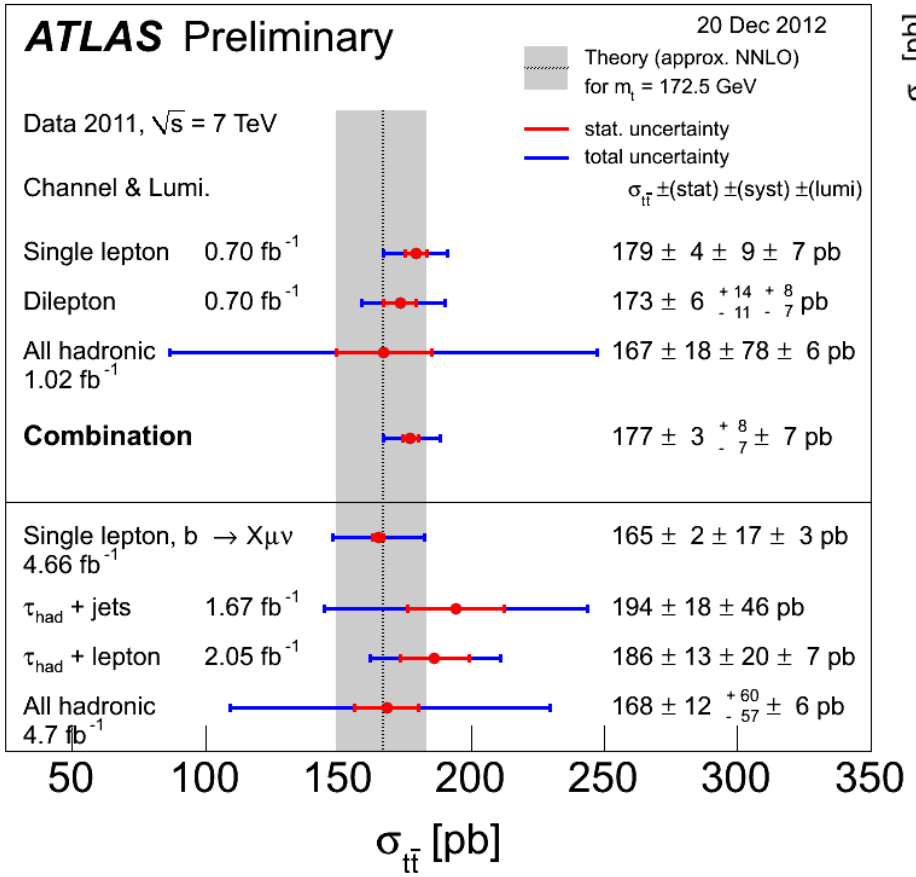
$\sigma_{tt} = 168 \pm 12\ (stat)\ ^{+60}_{-57}\ (syst) \pm 7\ (lumi)$ pb

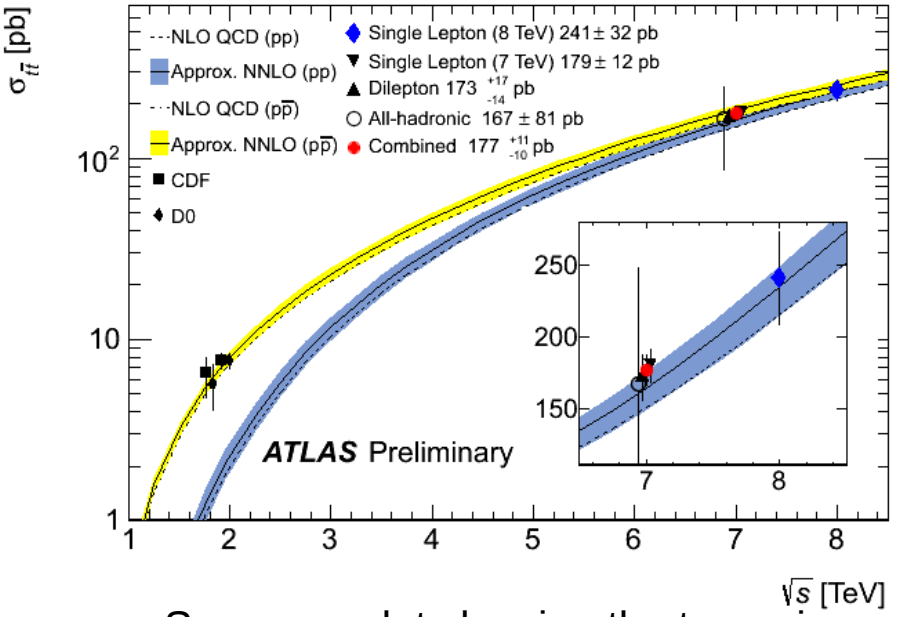
overall precision ~37%

Systematic uncertainties :
JES (+20, -17 pb), b-tagging (17 pb), ISR/FSR (17 pb)

pair production : cross section summary

The upper part of the left figure shows measurements that are averaged to give the combined value shown (see ATLAS-CONF-2012-024). The lower part shows additional newer measurements not included in the combination. New measurements are from: ATLAS-CONF-2012-131 (Single lepton b-tagged), arXiv:1211.7205 (tau+jets), PLB717 (2012) 89 (tau+lepton) and ATLAS-CONF-2012-031 (all hadronic)





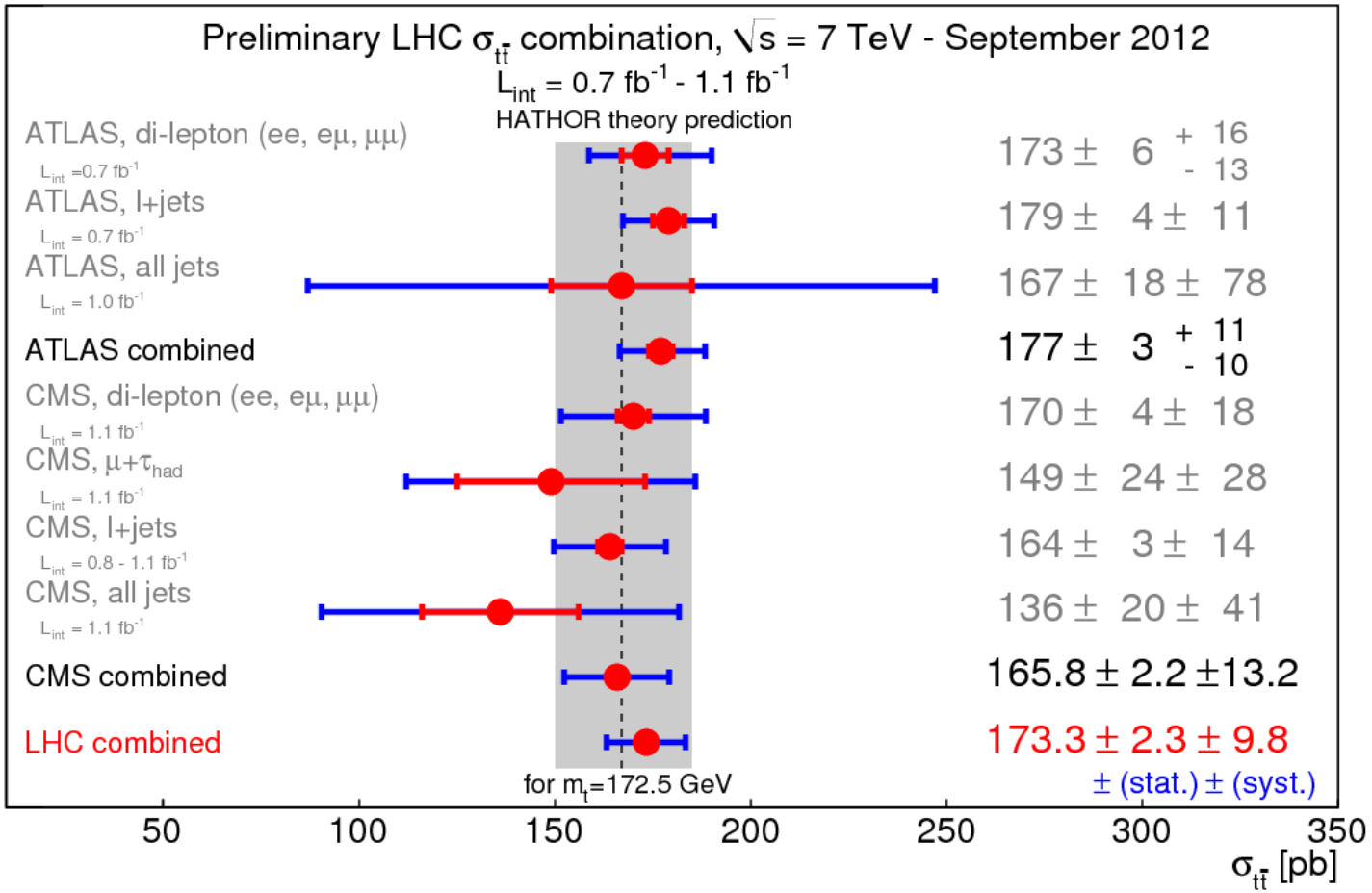
Summary plot showing the top pair production cross section as a function of the LHC proton proton center of mass energy including the new 8 TeV result from ATLAS-CONF-2012-149

σ_{tt}(8 TeV) = 241 ± 2 (stat) ± 31 (syst) ± 9 (lumi) pb

pair production : ATLAS-CMS combination

Combination of ATLAS and CMS top-quark pair cross section measurements using up to 1.1 fb^{-1} of data at 7 TeV

ATLAS-CONF-2012-134
CMS-PAS-TOP-12-003



pair production : charge asymmetry

- **Motivation**
  - top quark pair production has a small asymmetry under charge conjugation predicted by the SM
  - BSM could lead to an enhancement in this effect
- **Strategy**
  - analysis uses dilepton
  - can measure A^{ll} which is already sensitive to the same effect

contributions from IRFU

$$A_C^{\ell\ell} = \frac{N(\Delta|\eta| > 0) - N(\Delta|\eta| < 0)}{N(\Delta|\eta| > 0) + N(\Delta|\eta| < 0)},$$

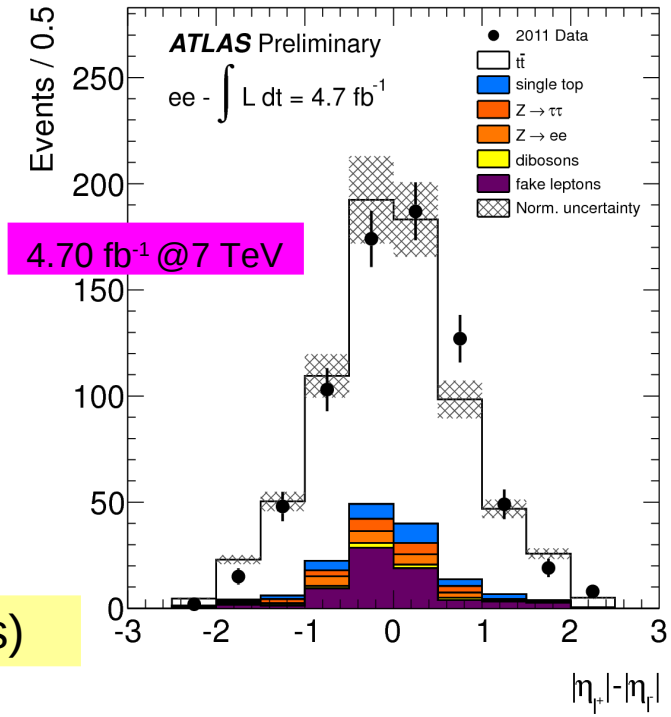
$$A_C^{t\bar{t}} = \frac{N(\Delta|y| > 0) - N(\Delta|y| < 0)}{N(\Delta|y| > 0) + N(\Delta|y| < 0)},$$

ATLAS-CONF-2012-057 (dilepton)
Eur. Phys. J. C (2012) 72:2039 (l+jets)

$A_C^{ll} = 0.057 \pm 0.024\ (stat) \pm 0.015\ (syst)$
$A_{SM}^{ll} = 0.006 \pm 0.002$

overall precision ~14%

Systematic uncertainties :
in ee : calibration (0.019), generator (0.011), fake lepton (0.014)



- measurement of A^{tt} requires a strategy to resolve the momentum of the two neutrinos

(Matrix Element Method)

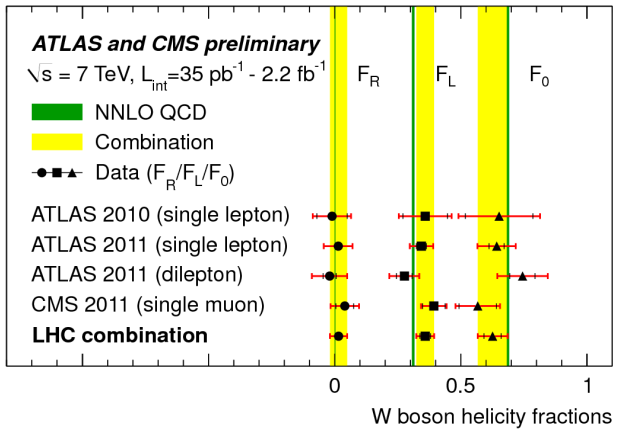
$A_C^{tt} = 0.029 \pm 0.018\ (stat) \pm 0.014\ (syst)$ (dilepton, l+jets)

pair production : W polarization in top decays

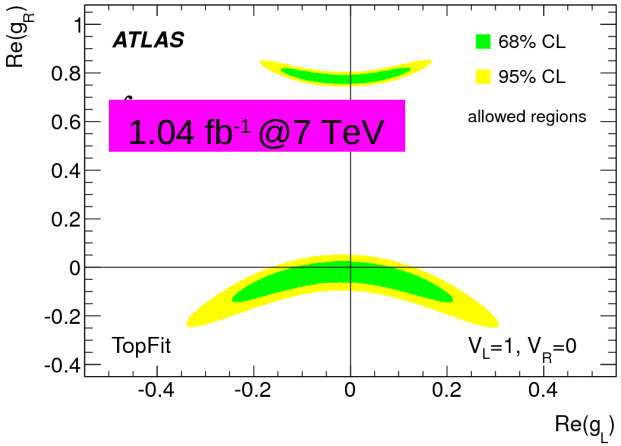
contributions from CPPM, LPSC

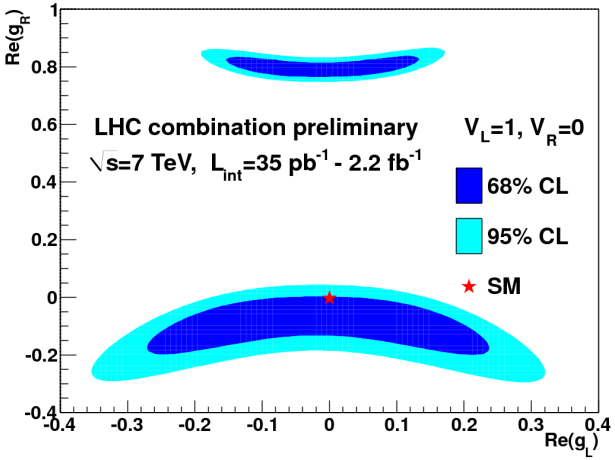
- **Motivation**
  - in t→Wb, W polarization can be longitudinal, left or right-handed
  - sensitive to anomalous contributions to W_{tb} couplings
- **Strategy**
  - the angular distribution is $\frac{1}{\sigma}\frac{d\sigma}{d\cos\theta^*} = \frac{3}{4}(1-\cos^2\theta^*)\,F_0 + \frac{3}{8}(1-\cos\theta^*)^2\,F_L + \frac{3}{8}(1+\cos\theta^*)^2\,F_R$
  - different strategies available
    - method 1 : comparing the observed cosθ* distribution with templates for W helicity states from simulation
    - method 2 : polarization is obtained through angular asymmetries $A_\pm = \frac{N(\cos\theta^* > z) - N(\cos\theta^* < z)}{N(\cos\theta^* > z) + N(\cos\theta^* < z)}$, with $z = \pm(1-2^{2/3})$ for $A_\pm$

JHEP 1206 (2012) 088
ATLAS-CONF-2013-033



W_{tb} anomalous couplings g_R and g_L





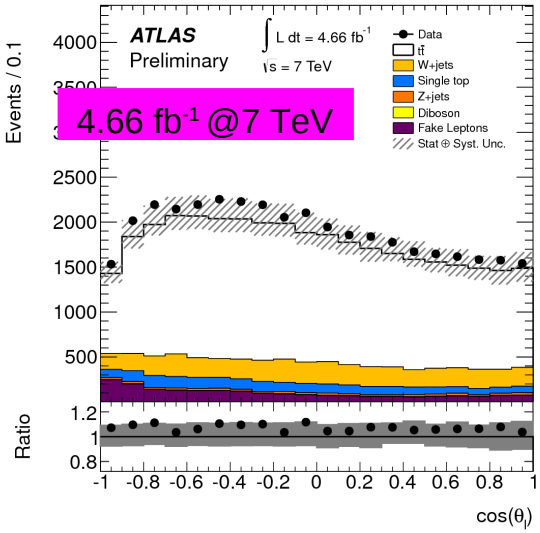
pair production : top quark polarization

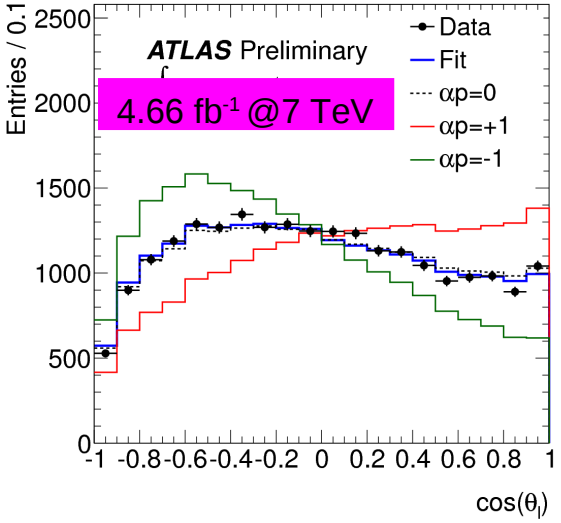
contributions from CPPM, IRFU

- **Motivation**
  - in SM top quarks are produced almost unpolarized
  - in some BSM scenarios, top quark are produced polarized
- **Strategy**
  - analysis uses lepton+jets
  - uses θ_l, polar angle of the lepton in the top quark rest frame
  - f is measured using template fit method : fully positively vs negatively polarized top quarks

$$f = \frac{1}{2} + \frac{N(\cos\theta_l > 0) - N(\cos\theta_l < 0)}{N(\cos\theta_l > 0) + N(\cos\theta_l < 0)}$$

ATLAS-CONF-2012-133





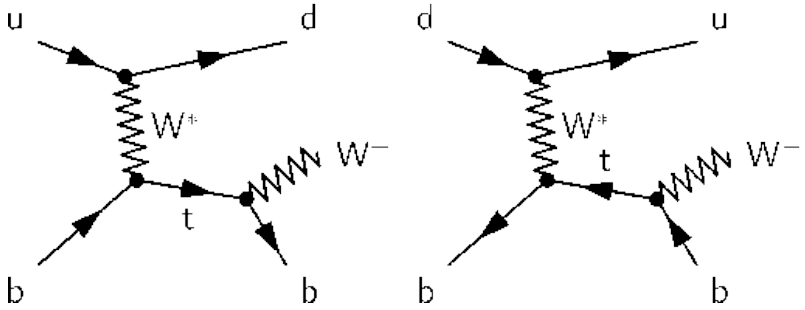
- SM expectation : $f_{SM} = 0.5$

$$f = 0.470 \pm 0.009\ (\text{stat})^{+0.023}_{-0.032}\ (\text{syst})$$

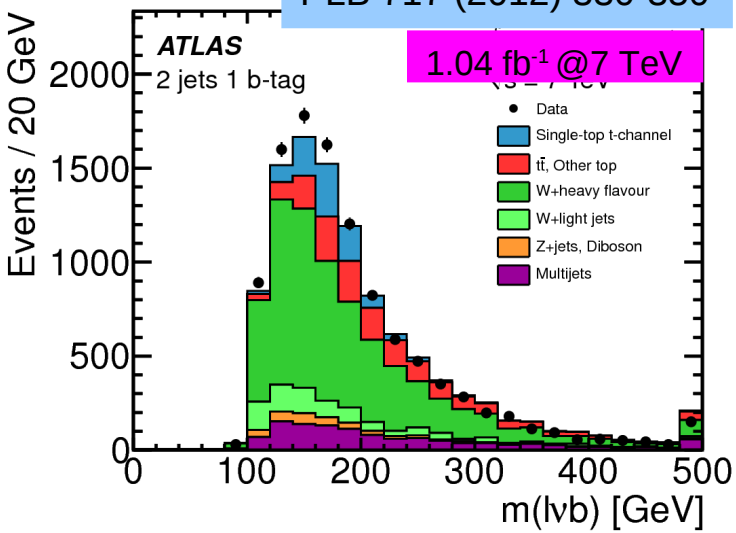
Electroweak production : t-channel

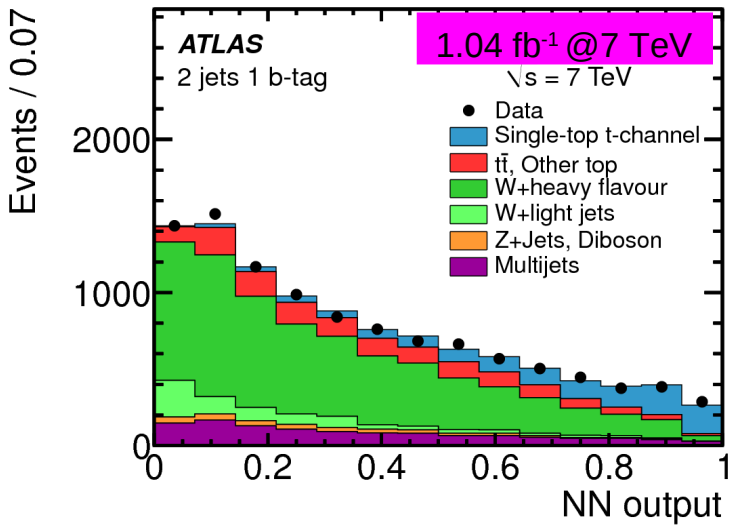
- **Motivation**
  - t-channel sensitive to V_{tb}
- **Event Selection**
  - 1 isolated e/μ + E_T^{miss} + 2 or 3 jets (1b)
- **Analysis strategy**
  - likelihood fit on NN discriminant

contributions from LPC, LPSC



PLB 717 (2012) 330-350





$\sigma_{t\text{-channel}} = 83 \pm 4\ (stat)\ ^{+20}_{-19}(syst)$ pb

$\sigma^{SM}_{t\text{-channel}} = 64.6\ ^{+2.7}_{-2.0}$ pb

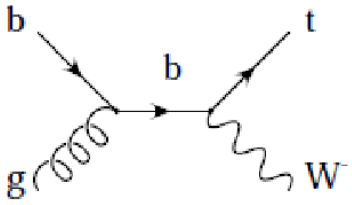
Systematic uncertainties :
b-tagging (13 pb), ISR/FSR (14 pb)
observed significance 7.2 σ

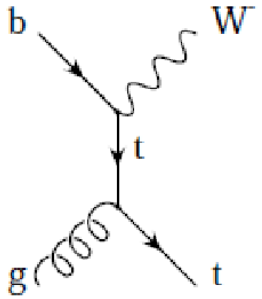
$|V_{tb}|>0.75$ @95% CL

Electroweak production : Wt-channel

contributions from LPSC

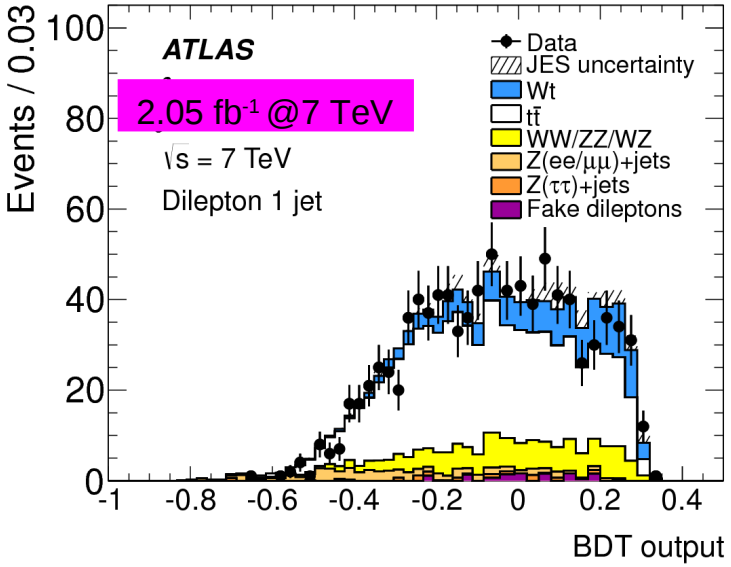
- **Motivation**
  - not yet observed @Tevatron due to its small cross section
  - sensitive to V_{tb}





- **Event Selection**
  - 2 isolated e/μ + E_T^{miss} + 1 jets
- **Analysis strategy**
  - Boosted Decision Tree (BDT) score of the event based on 22 kinematic variables
  - likelihood fit using BDT for each jet bin

Phys. Lett. B 716 (2012) 142-159



$\sigma_t = 16.8 \pm 2.9\ (stat) \pm 4.9\ (syst)$ pb

overall precision ~34%

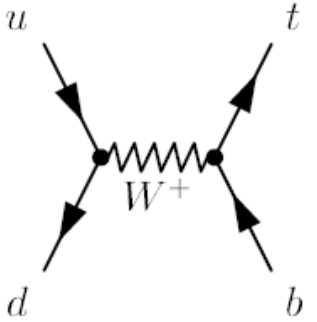
Systematic uncertainties :
JES (16%), parton shower (15%)

observed significance 3.3 σ
$|V_{tb}| = 1.03^{+0.16}_{-0.19}$ (assuming $|V_{tb}| >> |V_{ts}|, |V_{td}|$)

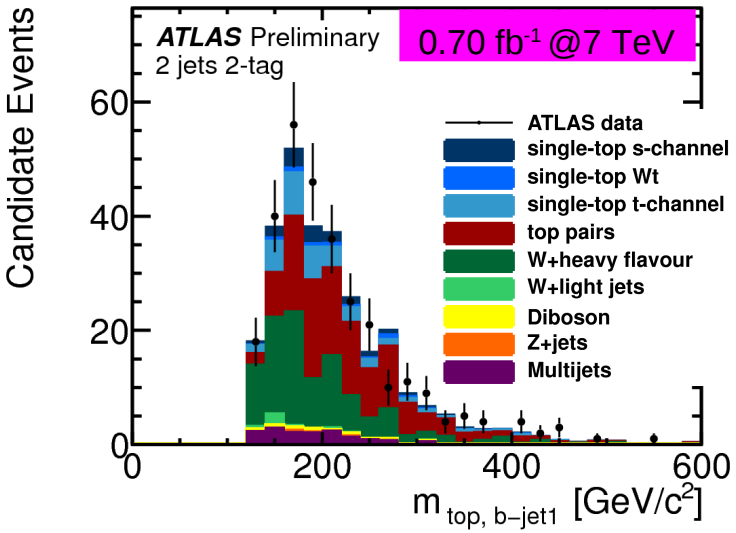
Electroweak production : s-channel

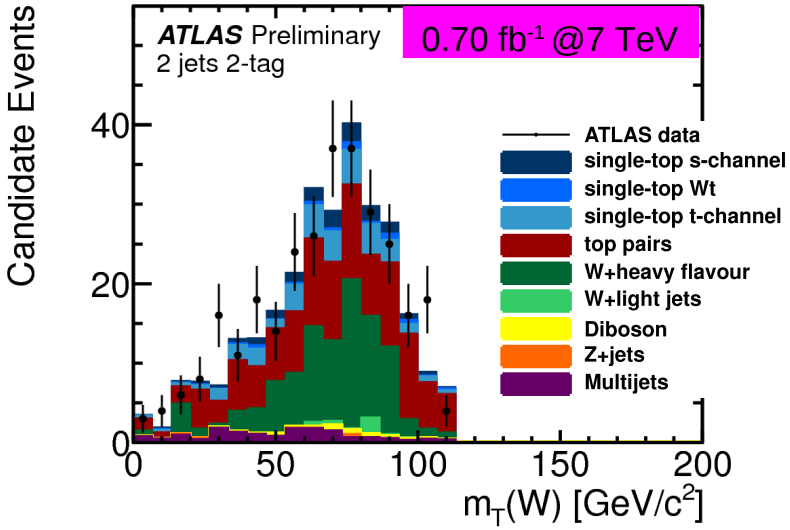
- **Motivation**
  - not yet observed due to its low cross section
  - sensitive to new physics such as W' or charged Higgs similar technique as in tb resonance search
- **Event Selection**
  - 1 isolated e/μ + E_T^{miss} + 2 b-jets
- **Analysis strategy**
  - cut-based selection
  - data-driven estimation of Z+jets, W+jets and multijets backgrounds

contributions from LPSC



ATLAS-CONF-2011-118



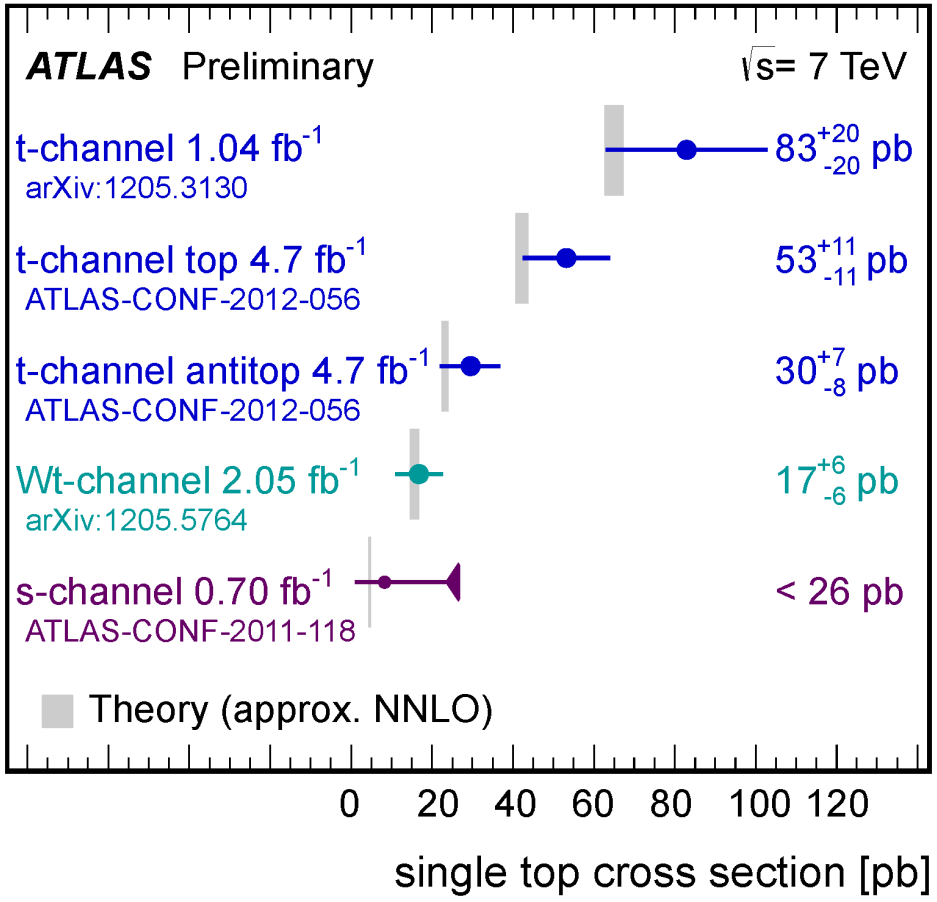


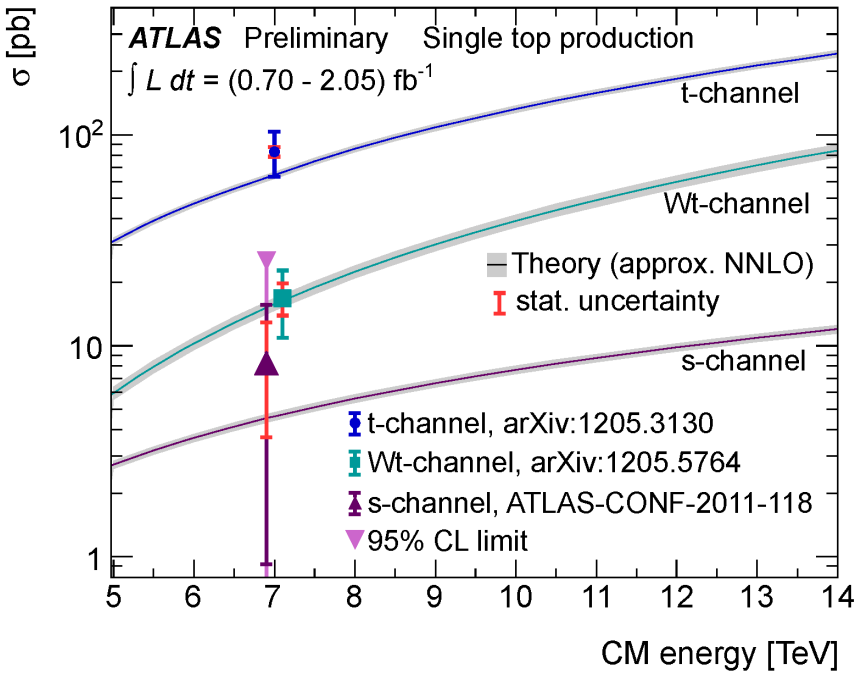
σ_t(s-channel)<26.5 pb @95% CL

σ_t^{SM}(s-channel) = 4.6± 0.3 pb
at NLO with NNLL corrections

Electroweak production : cross section summary

Summary of measurements of the single top production cross-section compared to the corresponding theoretical expectation





New ATLAS measurement at 8 TeV

$\sigma_{t\text{-channel}} = 95 \pm 2\ (stat) \pm 18\ (syst)$ pb

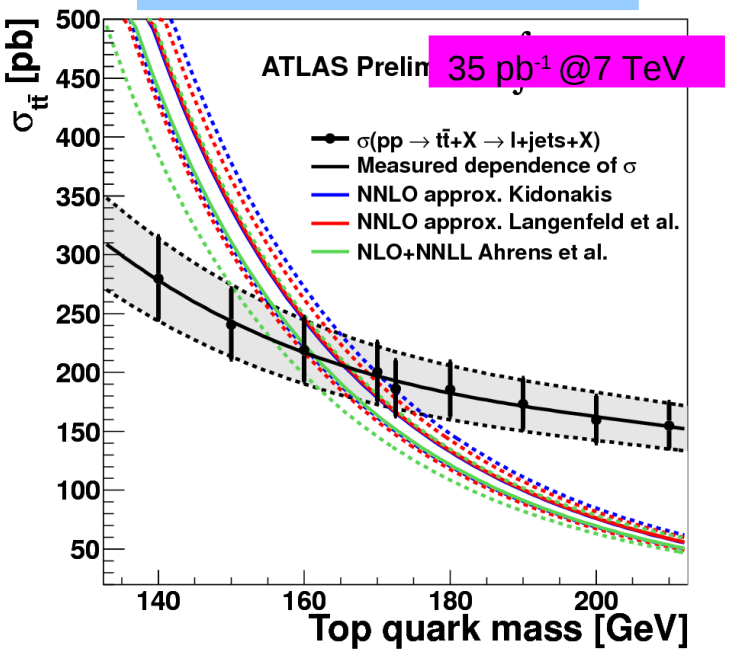
ATLAS-CONF-2012-132

Top mass measurement : semileptonic

- **Event selection similar to cross section study**
- **Strategy**
  - with first 2011 data, measurement done using cross section measurement (at pole mass) and comparison with prediction NNLO
  - with 2011 data, m_{top} and Jet Energy Scale Factor (JSF) simultaneously fitted using m_{top}^{reco} and m_{W}^{reco} distributions

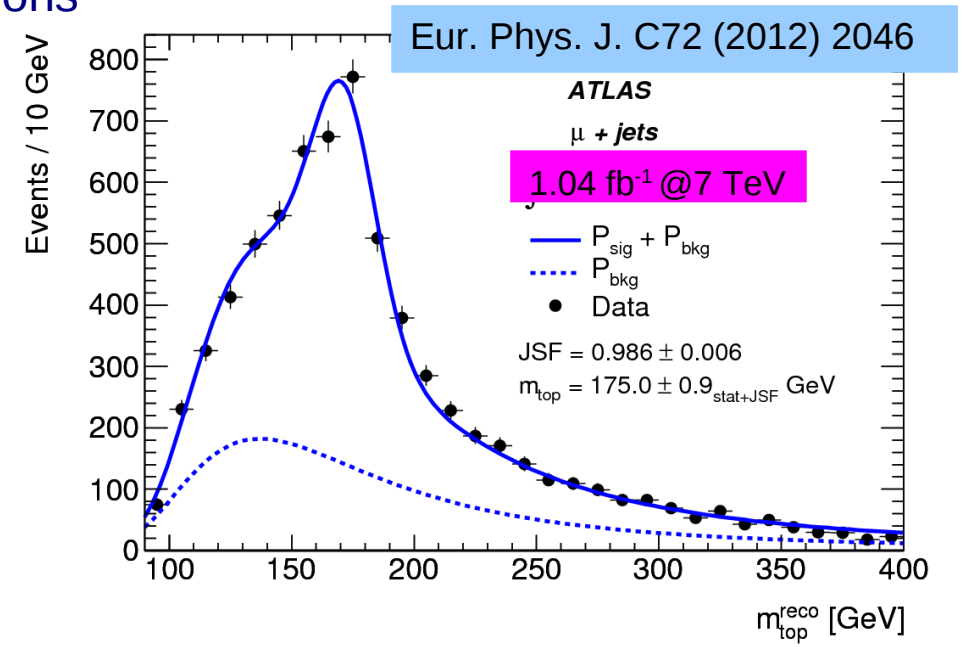
contributions from IRFU

ATLAS-CONF-2011-054



$m_{t\text{-pole}} = 166.4^{+7.8}_{-7.3}$ GeV

Eur. Phys. J. C72 (2012) 2046



$m_{top} = 174.5 \pm 0.6$ (stat) ± 2.3 (syst) GeV

overall precision ~1.4%

Systematic uncertainties :
bJES (1.58), JES (1.01), ISR/FSR (0.66)

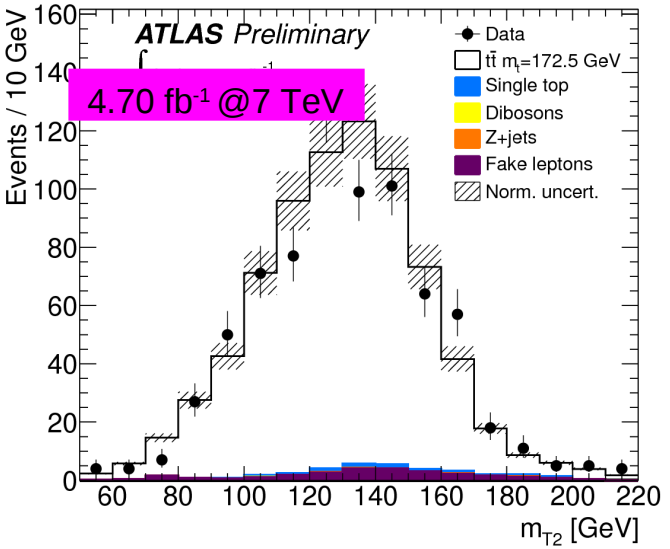
Top mass measurement : dilepton

- **Event selection similar to cross section study**

ATLAS-CONF-2012-082

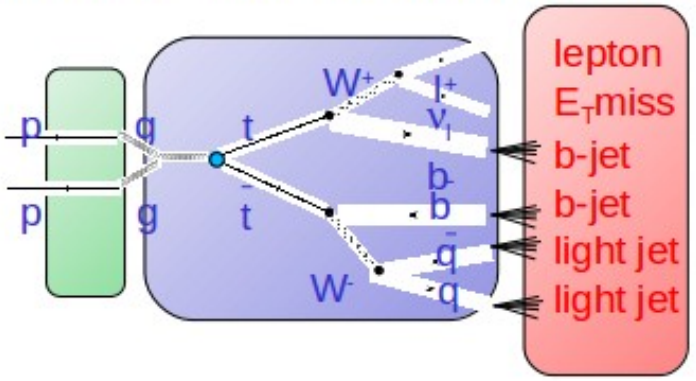
- **Neutrino method** contributions from IRFU
  - calculate probability for each neutrino pair possibility and use templates from MC
  - tested on MC in IRFU, used by ATLAS on data

$$m_{top} = 175.2 \pm 1.6\,(stat)^{+3.1}_{-2.8}\,(syst)\ GeV$$

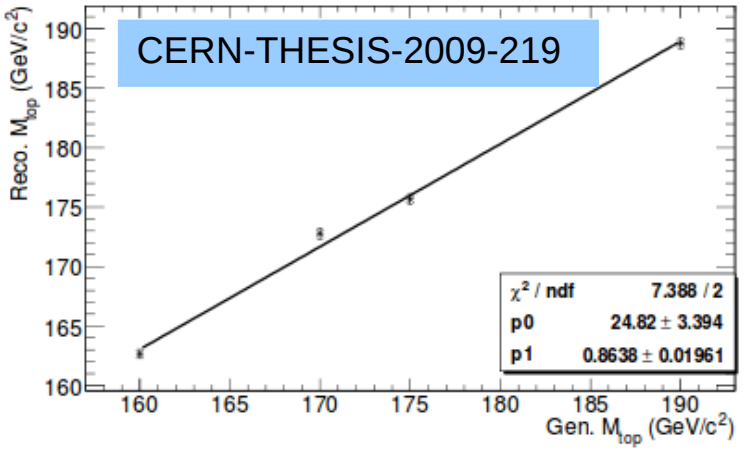


- **Matrix Element Method** contributions from LPNHE
  - calculate probability event by event
    - use full event kinematic information
    - likelihood function of m_{top} for a given set of observables + calibration curve

$$P_{sig}(x;m_t) \propto \int PDF \times Matrix\ Element \times Transfer\ function$$



CERN-THESIS-2009-219



- **developped on MC at 14 and 10 TeV, results expected on data soon**

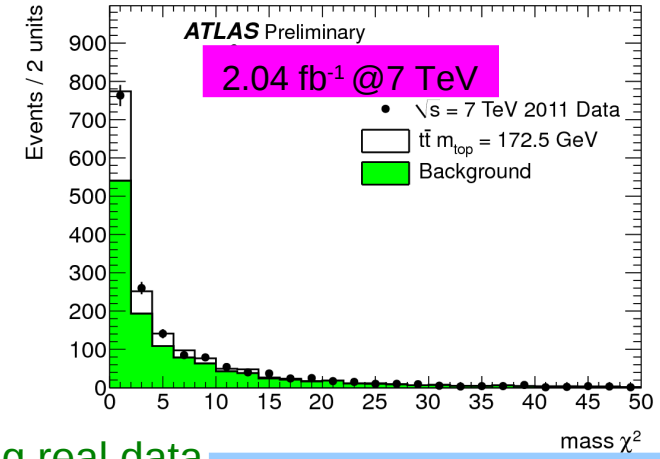
Top mass measurement : fully hadronic

- **Event selection similar to cross section study**
- **Strategy**
  - minimize global χ^2 to associate light (j) and b jets to hadronic top

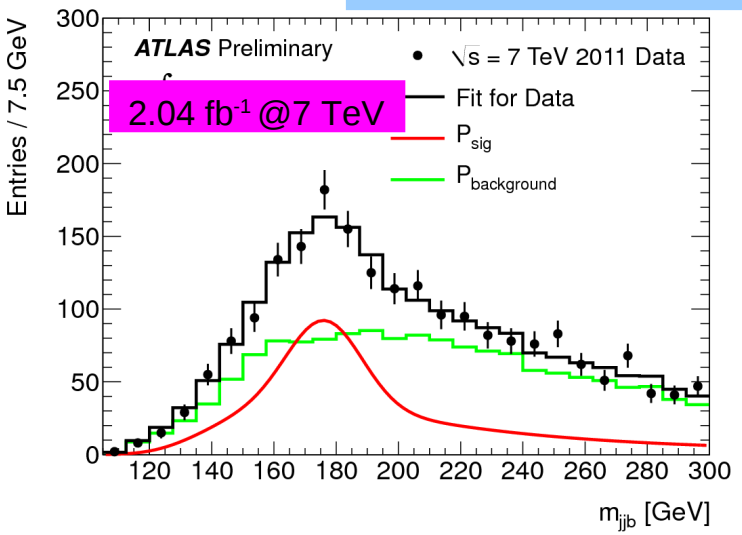
$$\chi^2 = \frac{(m_{j_1,j_2} - m_W)^2}{\sigma_W^2} + \frac{(m_{j_1,j_2,b_1} - m_t)^2}{\sigma_t^2} + \frac{(m_{j_3,j_4} - m_W)^2}{\sigma_W^2} + \frac{(m_{j_3,j_4,b_2} - m_t)^2}{\sigma_t^2}$$

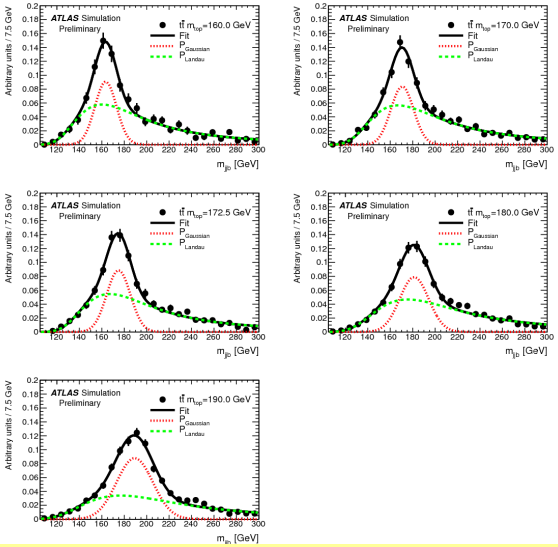
  - template fit method
    - MC tt with 5 top quark masses for the signal
    - background from multijets using event mixing using real data

contributions from LPC



ATLAS-CONF-2012-030



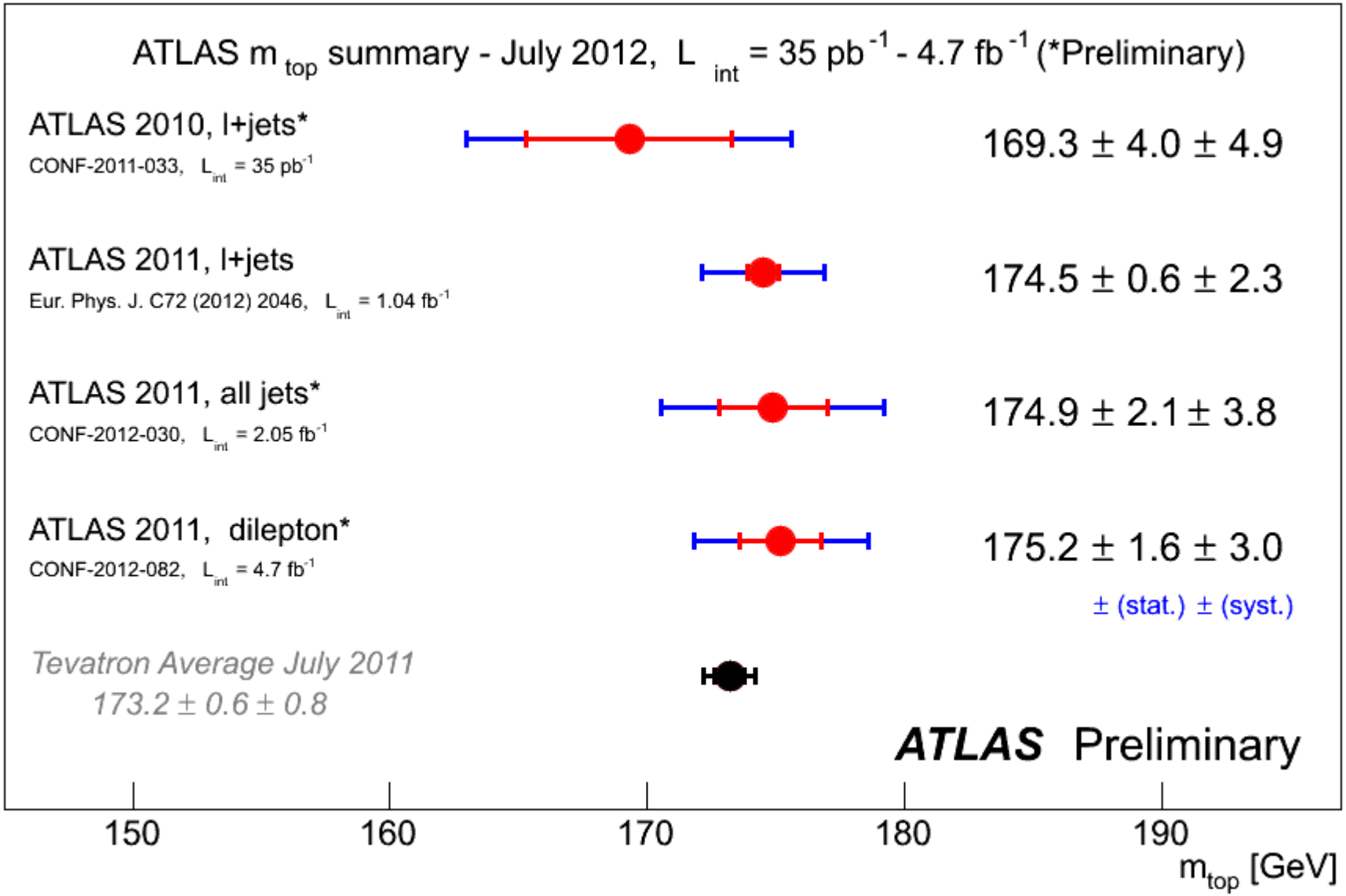


$m_{top} = 174.9 \pm 2.1\ (stat) \pm 3.8\ (syst)$ GeV

overall precision ~2.5%

Systematic uncertainties :
JES (2.1), background modelling (1.9), ISR/FSR (1.7)

Top mass measurement : ATLAS summary

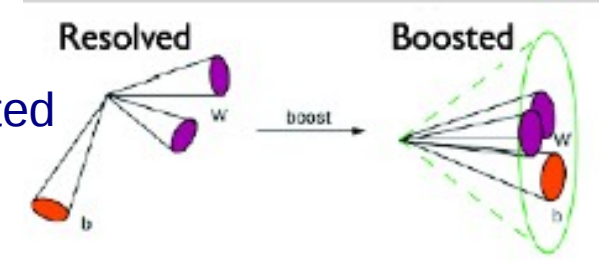


Search for top pair resonances (Z')

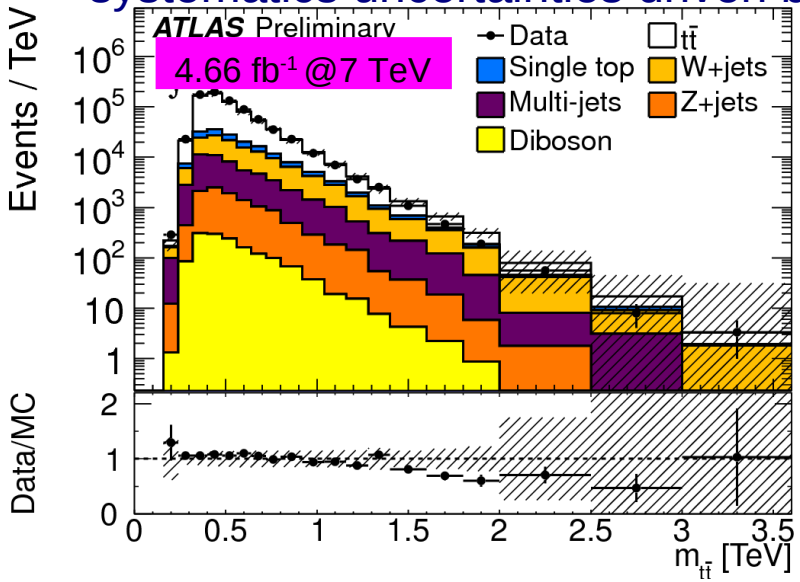
- **Motivation**
  - leptophobic Z', KK gluon … can decay primarirly to top quark pairs
  - perform a search for resonant production in m_{tt}

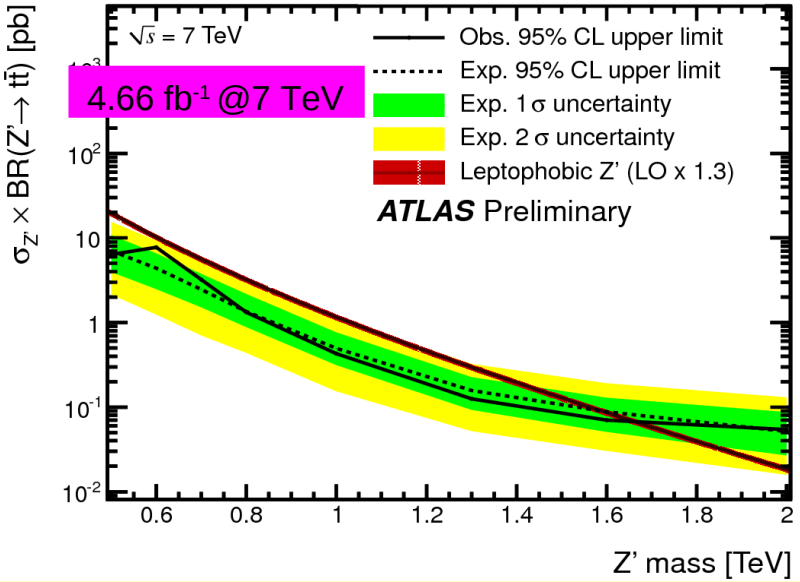
contributions from CPPM, LPC

- **Strategy**
  - adapt l+jet event selection when top decays are boosted
    - resolved : 3 or 4 narrow jets (anti-k_T 0.4)
    - boosted : 1 large jet (anti k_T 1) and one narrow
  - obtain m_{tt} by solving for mass constraints, E_T^{miss} as the (px,py) of the neutrino
  - systematics uncertainties driven by JES and tt normalization



ATLAS-CONF-2012-136



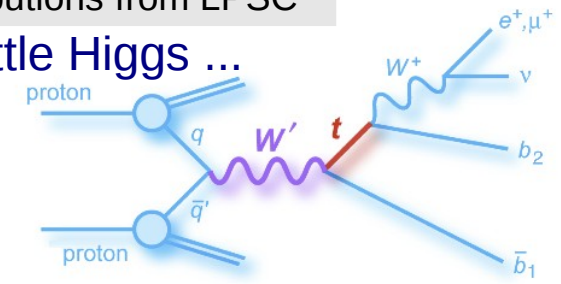


Lower limits observed on mass of 1.7 TeV for Z' and 1.9 TeV for g_{KK} @95%CL

Search for top+b-jet resonances (W')

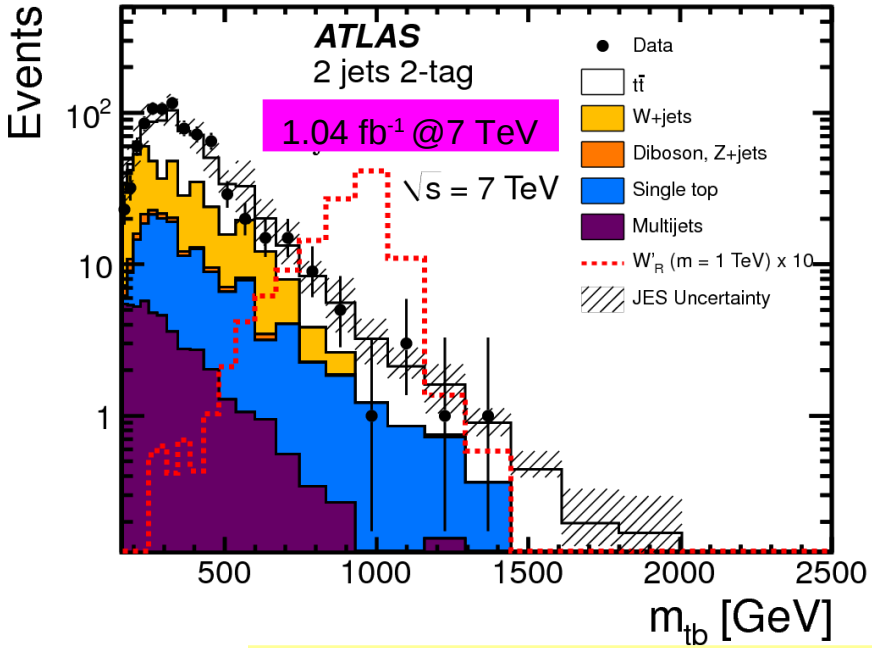
- **Motivation**
  - W' can be produced in universal XD, technicolor, Little Higgs ...
  - decay $W'_R \rightarrow$ tb used as a benchmark

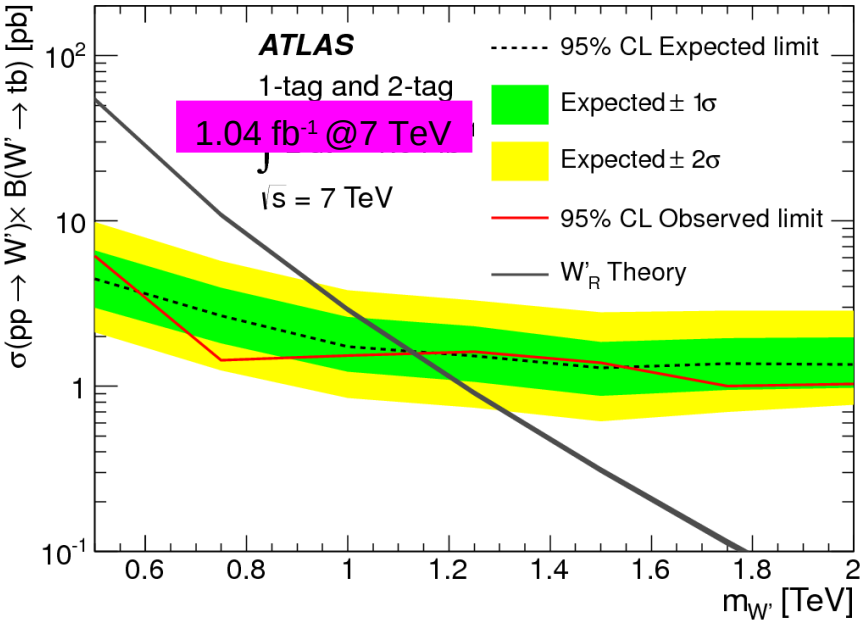
contributions from LPSC



- **Strategy**
  - perform a search in tb → (lvb)b channel
  - m_{tb} is used to discriminate signal from background

PRL 109 (2012) 081801





Lower limits observed @95% CL of 1130 GeV for W'_R

- **On going development**

contributions from LPC

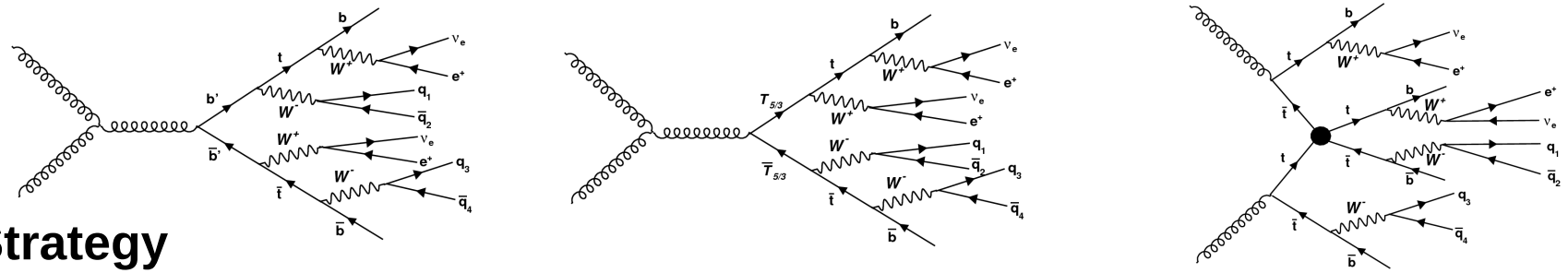
  - extend @8 TeV, more refined analysis, access to W' right and left-handed

Search for exotic same-sign dilepton signatures

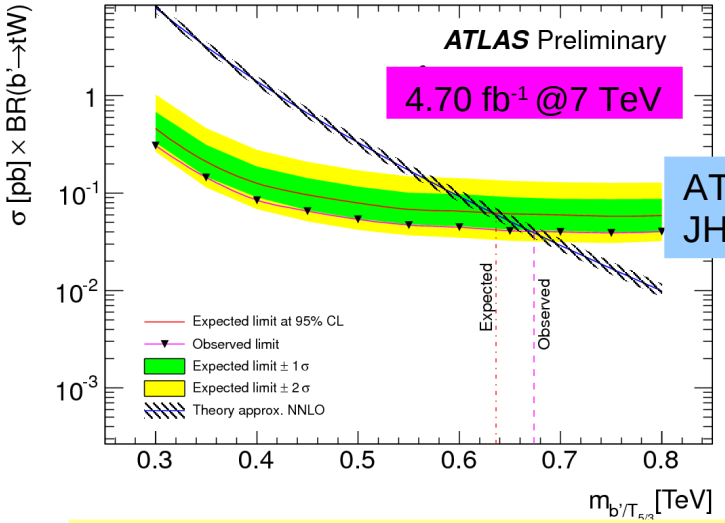
- **Motivation**

contributions from IRFU, LPC

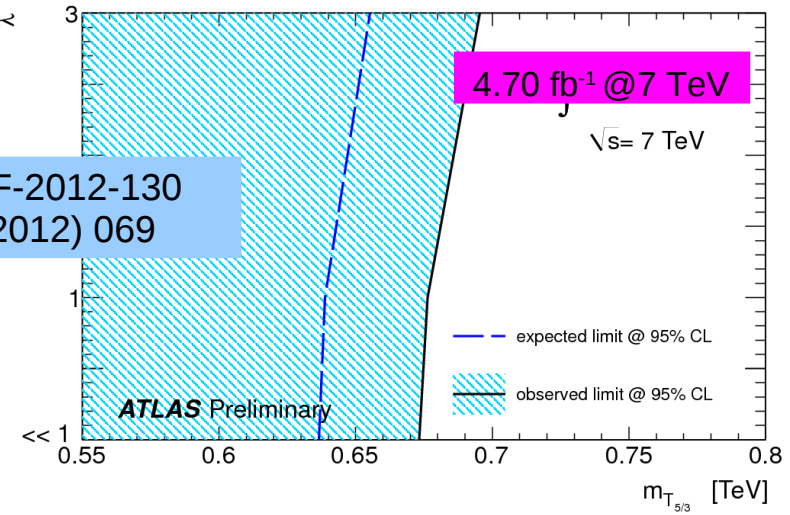
  - pair production of down type heavy quarks (b'), of $T_{5/3}$ and four top quarks



- **Strategy**
  - counting experiment performed in same charge ee, μμ and eμ channels
    - instrumental background : charge ^{miss} mis-identification, lepton mis-reconstruction
    - physics background : diboson + jet production, tt + diboson production
  - 4 events observed with an expected background of 5.6±1.7 events



ATLAS-CONF-2012-130
JHEP 1204 (2012) 069



m(b',$T_{5/3}$) <0.67 TeV @ 95% CL

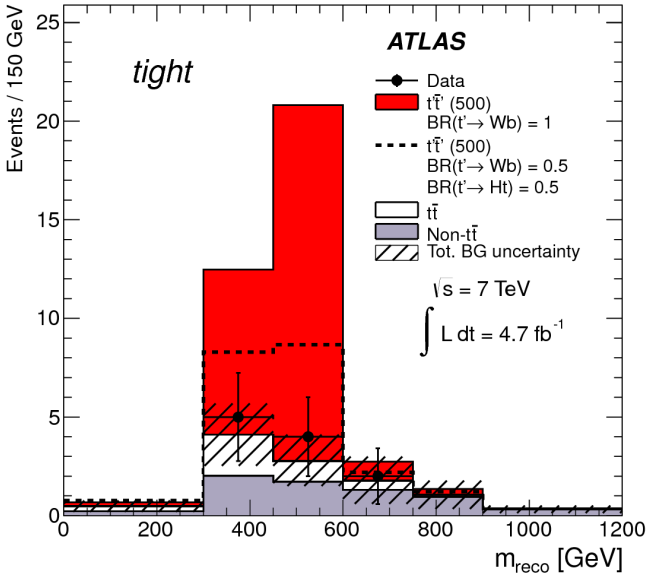
σ(4 top)<61 fb @95% CL

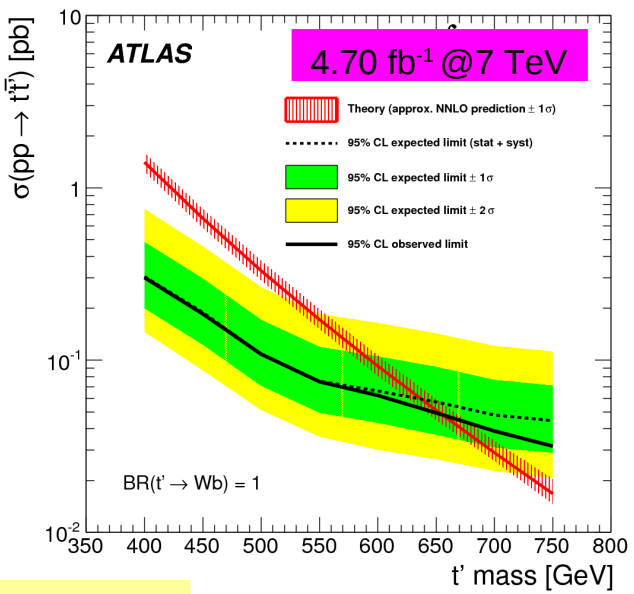
Search for 4th generation up type quark

contributions from CPPM

- **Motivation**
  - number of families limited to 9 (QCD asymptotic freedom)
  - Higgs particle not yet discovered when analysis started (both 4th generation quarks and Higgs are somehow incompatible)
  - analysis also interpreted in terms of vector-like production (t'→Wb, Ht, Zt)
- **Strategy**
  - search was done in l+jets and optimized for t'→Wb decay
    - reconstruct Boosted hadronic decaying W boson
    - build the reconstructed t' mass
    - tight cut based analysis

PLB 718 (2013) 1284-1302





$m_{t'} > 656$ GeV @95% CL

Search for $t\bar{t}$ + large E_T^{miss}

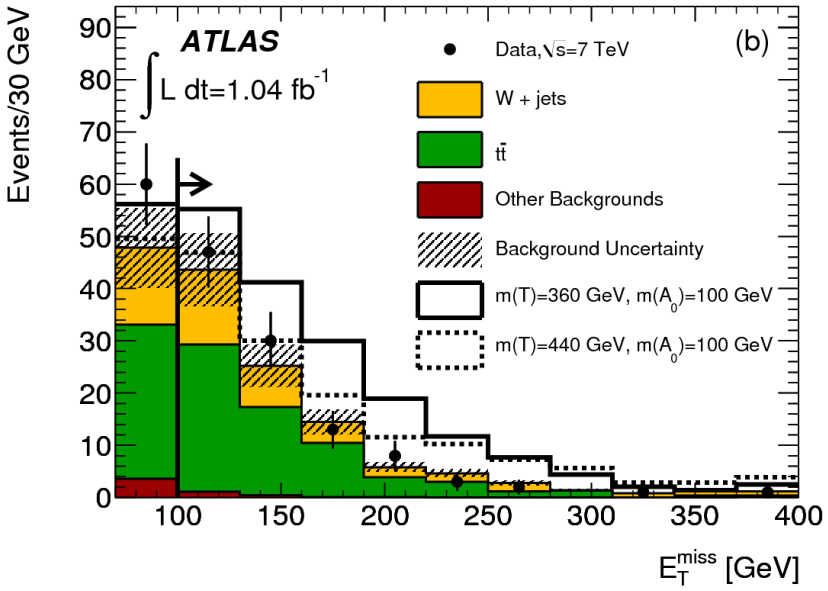
- **Motivation**
  - exotic top patners : $T\bar{T} \rightarrow t\bar{t}\, A_0 A_0$, A_0 scalar neutral, dark matter candidate

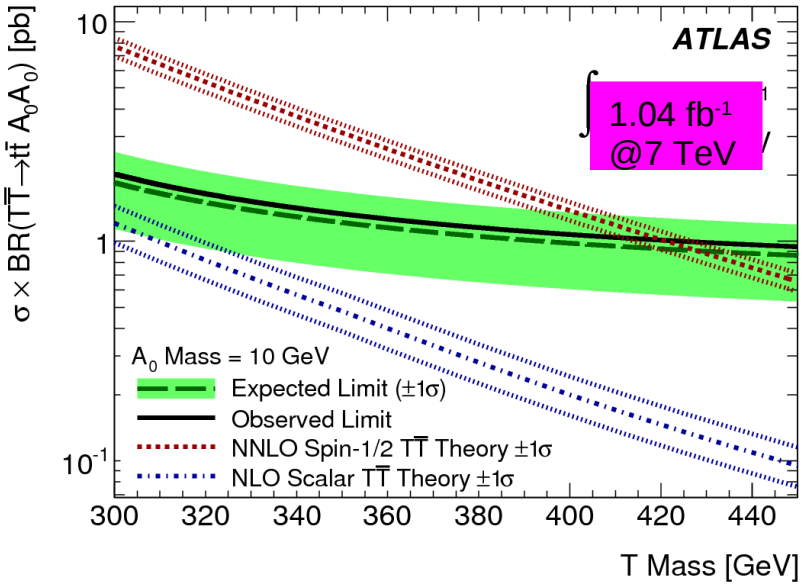
contributions from LAL

- **Strategy**
  - identical to $t\bar{t}$ final state with large E_T^{miss} from A_0 pairs
  - single lepton channel : $t\bar{t} \rightarrow$ lνb, qqb, ≥4 jets,
    - reduce W+jets E_T^{miss} > 100 GeV, m_T(W) > 150 GeV
    - reduce dilepton: veto on second lepton or isolated tracks

PRL 108 (2012) 041805

Source	Number of events
Dilepton $t\bar{t}$	62 ± 15
Single-lepton $t\bar{t}/W$+jets	33.1 ± 3.8
Multi-jet	1.2 ± 1.2
Single top	3.5 ± 0.8
Z+jets	0.9 ± 0.3
Dibosons	0.9 ± 0.2
Total	101 ± 16
Data	105



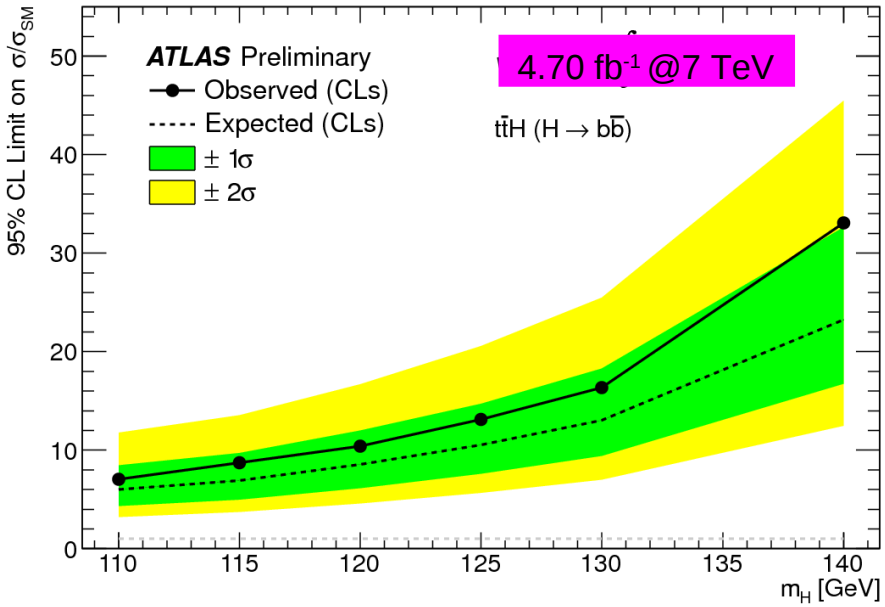


T mass up to 420 GeV : excluded @95%CL for m_{A0}<10 GeV

330 < T mass < 390 GeV : excluded @95%CL for m_{A0}<140 GeV

Associate production $t\bar{t}$ and Higgs boson

- **Previous work**
  - largely studied with on Monte Carlo before data taking
  - performance of b-tagging
- **Today's result**
  - semileptonic channel



latest ATLAS result
ATLAS-CONF-2012-135

Observed and expected (median, for the background-only hypothesis) 95% CL upper limits on $\sigma(t\bar{t}H) \times BR(H \rightarrow b\bar{b})$ relative to the SM prediction, as functions of m_H

- **Current development**

contributions from CPPM, LPC

  - all hadronic channel
    - evolution of fully hadronic cross section studies
    - necessity to fight against huge background

Conclusion

- **Summary of activities**
  - all groups have been involved in construction and maintenance of most of ATLAS subdetectors
  - groups have also been, and still are, largely involved in combined performance measurements
  - detailed description of membres, PhD and notes/articles in backup
    - ~28 senior physicists involved
    - 17 PhDs done on top physics with data, 14 are ongoing
    - few post-docs
- **Results obtained**
  - most of results published are done with 7 TeV data
  - results range from top properties (x-section, mass, spin, polarization etc) to exotic searches
- **On going work**
  - many new results expected with 8 TeV data
  - subjects studied by the groups are evolving
  - preparation of the next run (detector, performance, analyses)

https://twiki.cern.ch/twiki/bin/view/AtlasPublic/TopPublicResults

Detailed informations for each ATLAS France top group

For each ATLAS France group involved in top analysis we give

- the list of membres involved in top related analysis and their activities, restricted to what has been done with collision data
- the list of PhD theses (past and present)
- the list of articles, public notes and internal notes on performance studies in relation with top quark activities, with names of people involved
- the list of articles and public notes on top quark analyses, with names of people involved
- the list of articles and public notes related to detector activities are not reported

CPPM Marseille : top group

http://marpix1.in2p3.fr

Lorenzo Feligioni (CR)
Mossadek Talby (PR)
Alexandre Rozanov (DR)
Laurent Vacavant (DR)
Emmanuel Monnier (DR)

Daniele Madaffari (PhD 2012 →)
Limin Chen (PhD 2011 →)
Claudia Bertella (PhD 2010 →)
Bo Li (PhD 2010 →)

Nancy Tannoury (PhD → 2012)
Sahar Aoun (PhD → 2011)
Cécile Lapoire (PhD → 2010)
Georges Aad (PhD → 2009)
Rémi Zaidan (PhD → 2009)
Bernardo Resende (PhD → 2007)
Sébastien Corréard (PhD → 2006)
Jessica Levêque (PhD → 2003)
Luc Hinz (PhD → 2001)
Laurent Vacavant (PhD → 1997)

<u>General activities of top membres</u> :
Pixel, LAr, b-tagging
Convener b-tagging : L. Vacavant (2006-2008)
Top validation : Yann Coadou

<u>Top analyses</u> (on data):
tt cross section measurement in semileptonic and fully hadronic channels
tt differential cross section
top and W polarization
associated production Higgs + ttbar

CPPM Marseille : top PhD theses

Daniele Madaffari, *Recherche de la production associée du boson de Higgs avec des paires de quarks top dans l'état final complètement hadronique*, début 10/2012, dir. L. Feligioni, M. Talby
Limin Chen, *Etude de la polarisation du quark top avec le détecteur ATLAS auprès du LHC*, début 10/2011, dir. E. Monnier
Claudia Bertella, *Mesure de la section efficace de production de paires de quarks top-anti-top dans le canal hadronique avec le détecteur ATLAS auprès de LHC*, début 10/2010, dir. L. Feligioni, M. Talby
Bo Li, *Etude de la polarisation du boson W dans l'expérience ATLAS auprès du LHC*, début 10/2010, dir. E. Monnier

Nicolas Bousson, *Recherche d'un nouveau quark lourd avec l'experience ATLAS au LHC - Mise en oeuvre des algorithmes d'identification des jets b*, dir. L. Vacavant, A. Rozanov, 18 décembre 2012,
Nancy Tannoury, *Calibration des algorithmes d'identification des jets issus de quarks b et mesure de la section efficace différentielle de production de paires de quarks top-antitop en fonction de la masse et de la rapidité du système top-antitop dans les collisions p-p à une énergie au centre de masse de 7 TeV auprès de l'expérience ATLAS au LHC*, 9 octobre 2012, dir. M Talby
Sahar Aoun, Mise en œuvre du détecteur à Pixels et mesure de la section efficace de production
des jets issus de quarks beaux auprès de l'expérience ATLAS au LHC, 7 novembre 2011, dir. M. Talby
Cécile Lapoire, *Mise en oeuvre de l'étiquetage des jets issus de quarks beaux dans l'expérience ATLAS au LHC*, 22 septembre 2010, dir. L. Vacavant, A. Rozanov
Georges Aad, *Mise en service du détecteur a pixels de l'expérience ATLAS auprés du LHC et étude du canal ttH, H -> bb pour la recherche du boson de Higgs, 18 septembre 2009, dir. L. Vacavant, A. Rozanov*
Rémi Zaidan, *Recherche du boson de Higgs chargé dans le canal H+ -> tb et étiquetage des jets b avec l'expérience ATLAS auprès du LHC*, 17 septembre 2009, dir. M. Talby
Bernardo Resende, *Étude du quark top avec ATLAS au LHC. Mise en route du calorimètre électromagnétique*, 15 mai 2007, dir. E. Monnier
Sébastien Corréard, *Calibration de l'etiquetage de jets issus de quarks beaux et recherche du boson de Higgs dans le canal ttH -> lnub jjb bb dans l'experience ATLAS aupres du LHC*, 9 février 2006, dir. A. Rozanov
Jessica Levêque, *Recherche d'un boson de Higgs leger produit en association avec une paire de quarks top dans l'experience ATLAS*, 30 juin 2003, dir. A. Rozanov
Luc Hinz, *Etude expérimentale des performances du module 0 du calorimètre électromagnétique bouchon d'ATLAS. Etude de la corrélation de spin dans la production des paires ttbar au LHC*, 27 juin 2001, dir. S. Tisserant
Laurent Vacavant, *Etiquetage des quarks b par un détecteur de vertex à pixels dans l'expérience ATLAS auprès du LHC*, 1997, dir. A. Rozanov

CPPM Marseille : performances articles and notes

ATLAS-CONF-2011-143, *b-Jet Tagging Efficiency Calibration using the System 8 Method*, L. Feligioni, M. Talby, N. Tannoury, L. Vacavant
ATLAS-CONF-2011-102, *Commissioning of the ATLAS high-performance b-tagging algorithms in the 7 TeV collision data*, N. Bousson, L. Vacavant
ATLAS-CONF-2011-089, *Calibrating the b-Tag Efficiency and Mistag Rate in 35 pb^{-1} of Data with the ATLAS Detector*, S. Aoun, N. Bousson, L. Feligioni, M. Talby, N. Tannoury, L. Vacavant
ATLAS-CONF-2010-099, *Calibrating the b-Tag and Mistag Efficiencies of the SV0 b-Tagging Algorithm in 3~pb−1 of Data with the ATLAS Detector*, S. Aoun, N. Tannoury
ATLAS-CONF-2010-091, *Performance of Impact Parameter-Based b-tagging Algorithms with the ATLAS Detector using Proton-Proton Collisions at √s = 7 TeV*, N. Bousson, C. Lapoire, L. Vacavant
ATLAS-CONF-2010-087, *Background studies for top-pair production in lepton plus jets final states in √s=7 TeV ATLAS data*, N. Bousson, L. Feligioni, C. Lapoire, N. Tannoury, L. Vacavant
ATLAS-CONF-2010-070, *Tracking Studies for b-tagging with 7 TeV Collision Data with the ATLAS Detector*, N. Bousson, C. Lapoire, L. Vacavant
ATLAS-CONF-2010-041, *Impact parameter-based b-tagging algorithms in the 7 TeV collision data with the ATLAS detector: the TrackCounting and JetProb algorithms*, C. Lapoire, L. Vacavant
ATLAS-CONF-2010-040, *Tracking studies for b-tagging with 7 TeV collision data with the ATLAS detector*, N. Bousson, C. Lapoire, A. Rozanov, L. Vacavant

ATL-COM-PHYS-2013-098, *Object selection and calibration, background estimations and MC samples for the Winter 2013 Top Quark analyses with 2012 data*, Y. Coadou
ATL-COM-PHYS-2012-1197, *Object selection and calibration, background estimations and MC samples for the Autumn 2012 Top Quark analyses with 2011 data*, Y. Coadou
ATL-COM-PHYS-2012-499, *Object selection and calibration, background estimations and MC samples for the Summer 2012 Top Quark analyses with 2011 data*, Y. Coadou
ATL-COM-PHYS-2011-124, *b-jet Tagging for Top Physics: Perfomance studies, Calibrations and Heavy Flavor Fractions*, L. Feligioni, M. Talby, N. Tannoury
ATL-COM-PHYS-2010-764, *Measuring the b-tagging Efficiency with the System 8 Method Using Soft Muons*, L. Feligioni, M. Talby, N. Tannoury
ATL-PHYS-INT-2010-139, *Mis-identified lepton backgrounds to top quark pair production*, L. Feligioni, M. Talby, N. Tannoury
ATL-PHYS-INT-2010-133, B-tagging for top physics analyses with early ATLAS data at sqrt(s) = 7 TeV, H. Bachacou, N. Bousson, L. Feligioni, C. Lapoire, M. Talby, N. Tannoury, L. Vacavant

CPPM Marseille : top articles and notes

Phys. Lett. B 718 (2013) 1284-1302, *Search for pair production of a heavy top-like quarks decaying to a high-pT W boson and a b quark in the lepton plus jets final state at √s =7 TeV with the ATLAS detector,* N. Bousson , A. Rozanov, N. Tannoury, L. Vacavant
Eur. Phys. J. C (2013) 73: 2261, *Measurements of top quark pair relative differential cross-sections with ATLAS in pp collisions at √s = 7 TeV*, M. Talby, N. Tannoury
JHEP 1206 (2012) 088, *Measurement of W boson polarization in top quark decays with the ATLAS detector, L. Chen, B. Li, E. Monnier*
EPJC 71 (2011) 1577, *Measurement of the top quark pair production cross-section with ATLAS in pp collisions at √s = 7 TeV*, N. Bousson, L. Feligioni, C. Lapoire, M. Talby, N. Tannoury, L. Vacavant

ATLAS-CONF-2012-031, *Measurement of the tt^- production cross section in the all-hadronic channel in ATLAS with √s=7 TeV data*, C. Bertella, L. Feligioni
ATLAS-CONF-2011-140, *Measurement of tt^- production in the all-hadronic channel in 1.02 fb−1 of pp collisions at √s=7 TeV with the ATLAS detector*, C. Bertella, L. Feligioni
ATLAS-CONF-2011-066, *Search for ttbar production in the all-hadronic channel in ATLAS with sqrt{s} = 7 TeV data*, C. Bertella, L. Feligioni
ATLAS-CONF-2011-035, *Measurement of the top quark-pair cross-section with ATLAS in pp collisions at sqrt(s) = 7 TeV in the single-lepton channel using b-tagging*, L. Vacavant
ATLAS-CONF-2010-063, *Search for top pair candidate events in ATLAS at sqrt(s)=7 TeV*, N. Bousson, L. Feligioni, C. Lapoire, N. Tannoury, L. Vacavant

IRFU Saclay : top group

Henri Bachacou
Frédéric Déliot
Anne-Isabelle Etienvre
Jean-Pierre Meyer
Jérome Schwindling

Fabrice Balli (PhD 2011 →)
Liza Mijovic (CDD)

Cécile Déterre (PhD → 2012)
Léa Gauthier (PhD → 2012)
Jie Wu (PhD → 2011)
Antoine Marzin (PhD → 2010)

<u>General activities of top membres</u> :
LAr, b-tagging, computing
Scientist in charge of local Tier 2 : Jean-Pierre Meyer
Top mass sub-convener : Anne-Isabelle Etienvre (2009-2010)
Top Generator Modeling Uncertainties Contact : Liza Mijovic

<u>Top analyses</u> (on data):
top pair cross section measurement
top mass measurement in the semileptonic channel
charge asymmetry in dilepton channels
top quark polarization
Beyond Standard Model : search for top composite partners and 4 tops production

IRFU Saclay : top PhD theses

Fabrice Balli, *Mesure de la masse du quark top dans le canal semileptonique avec le détecteur ATLAS au LHC*, début octobre 2011, dir. B. Mansoulie

Cécile Deterre, *Étude dans les états finals dileptoniques de différentes propriétés des paires top-antitop avec les détecteurs D0 et ATLAS*, dir. D. Vilanova, F. Déliot, 26 juin 2012
Léa Gauthier, *Etudes dans le canal avec deux leptons de même signe de la physique du top au-delà du modèle standard*, dir. A-I Etienvre, 14 septembre 2012
Jie Wu, *Mesure de la section efficace de production de paires de quarks, top-antitop à l'aide des premières données du détecteur ATLAS auprès du LHC*, dir. B. Mansoulier, C. Shenjian, 15 mai 2011
Antoine Marzin, *Méthode de mesure de la masse du quark top avec le détecteur ATLAS au LHC ; Etude du fonctionnement du système de déclenchement de niveau 1 du calorimètre électromagnétique*, dir. J-P Meyer et A-I Etienvre, 27 septembre 2010

IRFU Saclay : performances articles and notes

ATLAS-CONF-2013-004, *Jet energy scale and its systematic uncertainty in proton-proton collisions at sqrt(s)=7 TeV with ATLAS 2011 data*, F. Balli, L. Mijovic
ATLAS-CONF-2011-089, *Calibrating the b-Tag Efficiency and Mistag Rate in 35 pb^{-1} of Data with the ATLAS Detector*, J. Schwindling
ATLAS-CONF-2010-100, *Soft muon tagging and Dstar/mu correlations in 7 TeV collisions with ATLAS*, H. Bachacou
ATLAS-CONF-2010-087, *Background studies for top-pair production in lepton plus jets final states in √s=7TeV ATLAS data*, H. Bachacou, L. Chevalier, A-I Etienvre, J. Schwindling, A. Marzin

ATL-COM-PHYS-2013-098, *Object selection and calibration, background estimations and MC samples for the Winter 2013 Top Quark analyses with 2012 data*, F. Balli, J. Schwindling
ATL-COM-PHYS-2013-008, *The Effects of Pile-up and Noise Thresholds on Jet and EmissT Performance in the ATLAS detector*, F. Balli
ATL-COM-PHYS-2012-1697, *Monte Carlo generator comparisons to ATLAS measurements constraining QCD radiation in top anti-top final states*, L. Mijovic
ATL-COM-PHYS-2012-1197, *Object selection and calibration, background estimations and MC samples for the Autumn 2012 Top Quark analyses with 2011 data*, F. Balli, J. Schwindling
ATL-COM-PHYS-2012-1044, *Jet performance at high luminosity plots for BOOST 2012*, F. Balli
ATL-COM-PHYS-2012-1034, *Performance of jet reconstruction and calibration at high pile-up*, F. Balli
ATL-COM-PHYS-2012-499, *Object selection and calibration, background estimations and MC samples for the Summer 2012 Top Quark analyses with 2011 data*, F. Balli, J. Schwindling
ATL-COM-PHYS-2012-224, *Object selection and calibration, background estimations and MC samples for the Winter 2012 Top Quark analyses with 2011 data*, F. Balli, J. Schwindling
ATL-COM-SOFT-2011-027, *G4 / ATLFAST II comparisons for the top quark mass measurement*, F. Balli, A-I Etienvre, J. Schwindling

IRFU Saclay : top articles and notes

Eur. Phys. J. C72 (2012) 2046, *Measurement of the Top Quark Mass with the Template Method in the ttbar -> lepton+jets Channel using ATLAS Data,* F. Balli, A-I Etienvre, J. Schwindling
Eur.Phys.J. C72 (2012) 2039, *Measurement of the charge asymmetry in top quark pair production in pp collisions at √s = 7 TeV using the ATLAS detector*, F. Déliot
JHEP 1204 (2012) 069, *Search for same-sign top quark production and fourth-generation down-type quarks in pp collisions at √s = 7 TeV with the ATLAS detector*, A-I Etienvre, L. Gauthier
EPJC 71 (2011) 1577*, Measurement of the top quark pair production cross-section with ATLAS in pp collisions at √s = 7 TeV*, H. Bachacou, J. Schwindling, J. Wu

ATLAS-CONF-2012-133, *Measurement of top quark polarisation in tt^- events with the ATLAS detector in proton-proton collisions at √s=7TeV*, F. Déliot, C. Déterre, L. Mijovic
ATLAS-CONF-2012-130, *Search for exotic same-sign dilepton signatures (b' quark, T_{5/3} and four top quarks production) in 4.7/fb of pp collisions at sqrt{s}=7 TeV with the ATLAS detector*, A-I Etienvre, L. Gauthier
ATLAS-CONF-2012-057, *Measurement of the charge asymmetry in dileptonic decay of top quark pairs in pp collisions at √s = 7 TeV using the ATLAS detector*, F. Déliot
ATLAS-CONF-2011-120, *Measurement of the top quark mass from 2011 ATLAS data using the template method*, A-I Etienvre
ATLAS-CONF-2011-106, *Measurement of the charge asymmetry in top quark pair production in pp collisions at sqrt{s}=7 TeV using the ATLAS detector*, F. Déliot
ATLAS-CONF-2011-054, *Determination of the Top-Quark Mass from the ttbar Cross Section Measurement in pp Collisions at sqrt(s)=7 TeV with the ATLAS detector*, F. Déliot
ATLAS-CONF-2011-035, *Measurement of the top quark-pair cross-section with ATLAS in pp collisions at sqrt(s) = 7 TeV in the single-lepton channel using b-tagging*, J. Schwindling, J. Wu
ATLAS-CONF-2011-033, *Measurement of the Top-Quark Mass using the Template Method in pp Collisions at root(s)=7 TeV with the ATLAS detector*, A-I Etienvre, J. Schwindling
ATLAS-CONF-2011-023, *Top Quark Pair Production Cross-section Measurements in ATLAS in the Single Lepton+Jets Channel without b-tagging*, J. Schwindling
ATLAS-CONF-2010-063, *Search for top pair candidate events in ATLAS at sqrt(s)=7 TeV*, H. Bachacou, L. Chevalier, A-I Etienvre, J. Schwindling, A. Marzin

LPC Clermont : top group

http://atlas-clermont.web.cern.ch/atlas-clermont/

Emmanuel Busato (MCF UBP)
Djamel Boumediene (CNRS)
David Calvet (CNRS)
Samuel Calvet (CNRS)
Julien Donini (PR UBP)
Philippe Gris (CNRS)
Dominique Pallin (CNRS)

Timothée Theveneaux-Pelzer (CDD 2012 →)
Nabil Ghodbane (CDD)
Hongbo Liao (CDD)
Geoffrey Gilles (PhD 2012 →)
Dorian Simon (PhD 2012 →)
Emmanuelle Dubreuil (PhD 2011 →)
Loic Valéry (PhD 2011 →)
Daniela Paredes (PhD 2010 →)

Reina Camacho (PhD → 2012)
Diane Cinca (PhD → 2011)
Pierre-Olivier Defay (PhD → 2008)
Eric Cogneras (PhD → 2007)
Pierrick Roy (PhD → 2002)

<u>General activities of membres</u> :
Tile, jet reconstruction and calibration,
jet vertex fraction
Scientist in charge of local Tier 2 : Dominique Pallin
Top convener : Dominique Pallin (2008-2009)

<u>Top analyses</u> (on data) :
tt cross section measurement in fully hadronic channel
top mass measurement in semileptonic and fully hadronic channels
Beyond Standard Model : ttbar resonance (Z'), single top+jet resonance (W'), sgluon in semileptonic events, same-sign top production, 4 top events production
associated production Higgs + ttbar

LPC Clermont : top PhD theses

Geoffrey Gilles, *Recherche de résonance lourde W' dans la physique du quark top*, début octobre 2012, dir. J. Donini
Dorian Simon, *Recherche de nouvelle physique dans les événements à quatre quarks top*, début septembre 2012, dir. E. Busato
Emmanuelle Dubreuil, *Etude de la production du quark top dans un canal tout hadronique*, début octobre 2011, dir. D. Pallin et D. Boumediene
Loic Valéry, *Recherche de nouvelle physique dans la production (semi-)leptonique de quarks top*, début octobre 2011, dir. Ph. Gris, S. Calvet
Daniela Paredes, *Recherche de nouvelle physique dans les événements à quatre quarks top*, début décembre 2010, dir. D. Calvet

Reina Camacho, *Recherche de nouvelles résonances se désintégrant en paires de quarks top avec le détecteur ATLAS du LHC*, 13 juillet 2012, dir. D. Pallin
Diane Cinca, *Etude de la production de paires de quarks TOP avec ATLAS au LHC, mesure de la masse du quark TOP*, 22 septembre 2011, dir. D. Pallin
Eric Cogneras, *Production de paires de Top et effet de Nouvelle Physique. Calibration des jets légers avec le processus W en jet-jet. Mesure de la masse du Top*, 29 juin 2007, dir. D. Pallin
Pierre-Olivier Defay, *Prospectives de recherche du quark de quatrième génération u4 avec le détecteur ATLAS auprès du LHC*, 4 juillet 2008, dir. D. Pallin, D. Calvet
Pierrick Roy, *Perspectives de mesure de la masse du quark Top avec le detecteur ATLAS*, 1 avril 2002, dir. D. Pallin

LPC Clermont : performances articles and notes

Eur. Phys. J. C, 73 3 (2013) 2304, *Jet energy measurement with the ATLAS detector in proton-proton collisions at √s = 7 TeV*, E. Busato, R. Camacho
ATLAS-CONF-2010-087, *Background studies for top-pair production in lepton plus jets final states in √s=7TeV ATLAS data*, D. Cinca, N. Ghodbane, H. Liao, D. Pallin
ATLAS-CONF-2010-087, *Properties of Jets and Inputs to Jet Reconstruction and Calibration with the ATLAS Detector Using Proton-Proton Collisions at s√=7 TeV*, E. Busato, R. Camacho

ATL-COM-PHYS-2013-098, *Object selection and calibration, background estimations and MC samples for the Winter 2013 Top Quark analyses with 2012 data*, S. Calvet, R. Camacho, N. Ghodbane, T. Theveneaux-Pelzer, L. Valery
ATL-COM-PHYS-2012-1197, *Object selection and calibration, background estimations and MC samples for the Autumn 2012 Top Quark analyses with 2011 data*, S. Calvet, R. Camacho, N. Ghodbane
ATL-COM-PHYS-2012-1153, *Calibration of light jets using the W mass in ttbar events*, D. Boumediene, D. Cinca, D. Pallin
ATL-COM-PHYS-2012-499, *Object selection and calibration, background estimations and MC samples for the Summer 2012 Top Quark analyses with 2011 data*, S. Calvet, R. Camacho, N. Ghodbane
ATL-COM-PHYS-2012-224, *Object selection and calibration, background estimations and MC samples for the Winter 2012 Top Quark analyses with 2011 data*, S. Calvet, R. Camacho, N. Ghodbane
ATL-COM-PHYS-2011-1167, *Insitu calibration of light jets using the W mass in tt^{-} events in ATLAS with √s = 7 TeV data*, D. Boumediene, D. Cinca, D. Pallin
ATL-COM-PHYS-2011-132, *Jets, Missing Transverse Energy and Taus for Top Physics Analyses in Release 16 with the 2010 Dataset*, D. Boumediene, D. Cinca, N. Ghodbane, H. Liao, D. Pallin
ATL-COM-PHYS-2010-835, *Jet selection for top physics*, D. Boumediene, N. Ghodbane, H. Liao, D. Pallin
ATL-PHYS-INT-2010-135, *Missing Transverse Energy for Top Physics analyses with early ATLAS data at sqrts=7~TeV*, D. Cinca, D. Pallin

LPC Clermont : top articles and notes

On going approval for notes on ttbar resonances, same sign leptons, W'

arXiv:1212.3360 [hep-ph], *Searching for sgluons in multitop events at a center-of-mass energy of 8 TeV*, S. Calvet, B. Fuks, Ph. Gris, L. Valery, (accepted by JHEP March 2013)
Eur.Phys.J. C72 (2012) 2083, *A search for ttbar resonances with the ATLAS detector in 2.05 fb-1 of proton-proton collisions at √s = 7 TeV,* S. Calvet, R. Camacho, L. Valéry
Phys. Lett. B 717 (2012) 330-350, *Measurement of the t-channel single top-quark production cross section in pp collisions at √s = 7 TeV with the ATLAS detector*, J. Donini
EPJC 71 (2011) 1577, *Measurement of the top quark pair production cross-section with ATLAS in pp collisions at √s = 7 TeV*, D. Boumediene, D. Cinca, N. Ghodbane, H. Liao, D. Pallin

ATLAS-CONF-2012-136, *A search for $t\bar{t}$ resonances in the lepton plus jets final state using 4.66 fb-1 of pp collisions at √s = 7 TeV,* S. Calvet, R. Camacho, L. Valéry
ATLAS-CONF-2012-130, *Search for exotic same-sign dilepton signatures (b' quark, T_{5/3} and four top quarks production) in 4.7/fb of pp collisions at sqrt{s}=7 TeV with the ATLAS detector*, E. Busato, D. Calvet, D. Paredes
ATLAS-CONF-2012-031, *Measurement of the tt^- production cross section in the all-hadronic channel in ATLAS with √s=7 TeV data*, D. Boumediene, E. Dubreuil, N. Ghodbane, H. Liao, D. Pallin
ATLAS-CONF-2012-030, *Determination of the Top Quark Mass with a Template Method in the All Hadronic Decay Channel using 2.04/fb of ATLAS DATA*, H. Liao, N. Ghodbane, D. Pallin
ATLAS-CONF-2012-029, *A Search for tt^- Resonances in the Lepton Plus Jets Channel using 2.05 fb−1 of pp Collisions at √s=7 TeV*, S. Calvet
ATLAS-CONF-2011-140, *Measurement of tt^- production in the all-hadronic channel in 1.02~fb−1 of pp collisions at s√=7 TeV with the ATLAS detector*, D. Boumediene, E. Dubreuil, N. Ghodbane, H. Liao, D. Pallin
ATLAS-CONF-2011-087, *A Search for tt^- Resonances in the Lepton Plus Jets Channel in 200 pb−1 of pp Collisions at √s=7 TeV*, S. Calvet, R. Camacho, D. Pallin
ATLAS-CONF-2011-070, *A Search for New High-Mass Phenomena Producing Top Quarks with the ATLAS Experiment*, S. Calvet, R. Camacho, D. Pallin
ATLAS-CONF-2010-087, *Background studies for top-pair production in lepton plus jets final states in √s=7TeV ATLAS data*, D. Cinca, N. Ghodbane, H. Liao, D. Pallin
ATLAS-CONF-2010-063, *Search for top pair candidate events in ATLAS at sqrt(s)=7 TeV*, D. Cinca, N. Ghodbane, H. Liao, D. Pallin

LPNHE Paris : top group

http://lpnhe.in2p3.fr/atlas/Atlas/index.html

Tristan Beau (MCF UPD)
Frédéric Derue (CR)
Didier Lacour (DR)
Bogdan Malaescu (CR)
Mélissa Ridel (MCF UPD)
Sophie Trincaz-Duvoid (MCF UPMC)

Sylvestre Pires (PhD 2012 →)
Aurélien Demilly (PhD 2011 →)
Guillaume Lefebvre (PhD 2011 →)

Timothée Theveneaux-Pelzer (PhD → 2012)
Stéfania Bordoni (PhD → 2011)
Eric Cogneras (CDD → 2011)
Pietro Cavalleri (PhD → 2009)

General activities of membres :
LAr, electron reconstruction and identification, jet calibration, top fake electrons, computing
Scientist in charge of local Tier 2: Frédéric Derue
Egamma software : Frédéric Derue (2007-2010)
Jet/ETmiss “Jet Energy Scale and Resolution” sub-convener : Bogdan Malaescu

Top analyses (on data) :
tt cross section measurement in dilepton channel
tt cross section measurement in fully hadronic channel
top mass measurement in dilepton channel

LPNHE Paris : top PhD theses

Sylvestre Pires, *Mesure de la masse du quark top dans le canal en dilepton dans l'expérience ATLAS auprès du LHC*, début 10/2012, dir. F. Derue
Aurélien Demilly, *Mesure de la masse du quark top dans le canal en dilepton dans l'expérience ATLAS auprès du LHC*, début 10/2011, dir. D. Lacour, T. Beau
Guillaume Lefebvre, *Mesure de la section efficace de production de paires de quarks top dans le canal complètement hadronique dans l'expérience ATLAS auprès du LHC*, début 10/2011,
dir. M. Ridel, S. Trincaz-Duvoid

Timothée Theveneaux-Pelzer, *Études sur la reconstruction des électrons et mesure de la section efficace de production de paires de quarks top dans les canaux dileptoniques dans l'expérience ATLAS auprès du LHC*, 3 juillet 2012, dir. F. Derue
Stéfania Bordoni, *Mesure de la section efficace de production des quarks beaux et charmés à partir de leur désintégration semi-leptonique en électrons avec l'expérience ATLAS dans les collisions protons-protons à sqrt(s) = 7 TeV au LHC*, 16 septembre 2011, dir. M. Ridel
Pietro Cavalleri, *Etude de la faisabilité de la mesure de la masse du quark top dans le canal électron muon avec la méthode des éléments de matrice avec le détecteur ATLAS auprès du LHC*, 18 septembre 2009, dir. D. Lacour

LPNHE Paris : performances articles and notes

Eur. Phys. J. C, 73 3 (2013) 2306, *Jet energy resolution in proton-proton collisions at √s = 7 TeV recorded in 2010 with the ATLAS detector*, B. Malaescu
Eur. Phys. J. C 72 (2012) 1909, *Electron performance measurements with the ATLAS detector using the 2010 LHC proton-proton collision data*, F. Derue, T. Theveneaux-Pelzer
Phys.Lett. B707 (2012) 438-458, *Measurements of the electron and muon inclusive cross-sections in proton-proton collisions at √s = 7 TeV with the ATLAS detector*, S. Bordoni, M. Ridel, S. Trincaz-Duvoid

ATLAS-CONF-2013-004, *Jet energy scale and its systematic uncertainty in proton-proton collisions at sqrt(s)=7 TeV with ATLAS 2011 data*, B. Malaescu
ATLAS-CONF-2010-087, *Background studies for top-pair production in lepton plus jets final states in √s=7TeV ATLAS data*, F. Derue, T. Theveneaux-Pelzer
ATL-PHYS-INT-2010-139, *Mis-identified lepton backgrounds to top quark pair production*, S. Bordoni, M. Ridel, S. Trincaz-Duvoid

ATL-COM-PHYS-2013-098, *Object selection and calibration, background estimations and MC samples for the Winter 2013 Top Quark analyses with 2012 data*, F. Derue
ATL-COM-PHYS-2012-1197, *Object selection and calibration, background estimations and MC samples for the Atumun 2012 Top Quark analyses with 2011 data*, F. Derue, T. Theveneaux-Pelzer
ATL-COM-PHYS-2012-499, *Object selection and calibration, background estimations and MC samples for the Summer 2012 Top Quark analyses with 2011 data*, F. Derue, T. Theveneaux-Pelzer
ATL-COM-PHYS-2012-224, *Object selection and calibration, background estimations and MC samples for the Winter 2012 Top Quark analyses with 2011 data*, F. Derue, T. Theveneaux-Pelzer
ATL-COM-PHYS-2011-168, *Mis-identified lepton backgrounds in top quark pair production studies for EPS 2011 analyses*, F. Derue, T. Theveneaux-Pelzer
ATL-COM-PHYS-2011-123, *Lepton trigger and identification for the Winter 2011 top quark analyses*, F. Derue, T. Theveneaux-Pelzer
ATL-COM-PHYS-2011-123, *Lepton Trigger and Identification for the first Top quark observation*, F. Derue

LPNHE Paris : top articles and notes

EPJC 71 (2011) 1577, *Measurement of the top quark pair production cross-section with ATLAS in pp collisions at √s = 7 TeV*, S. Bordoni, F. Derue, M. Ridel, T. Theveneaux-Pelzer, S. Trincaz-Duvoid

ATLAS-CONF-2010-063, *Search for top pair candidate events in ATLAS at sqrt(s)=7 TeV*,
F. Derue, T. Theveneaux-Pelzer

LPSC Grenoble : top group

http://lpsc.in2p3.fr/index.php/activites-scientifiques/atlas-ilc/activites-atlas/presentation-atlas

Benoit Clément (MCF UJF)
Sabine Crépé-Renaudin (CR)
Pierre-Antoine Delsart (CR)
Annick Lleres (CR)
Arnaud Lucotte (DR)

Caterina Monini (PhD 2011 →)
Benjamin Decheneaux (PhD 2010 →)
Xia Shun (PhD 2010 →)

Thomas Delemontex (PhD → 2012)
Jin Wang (PhD → 2012)
Julien Donini (CDD → 2011)
Carole Weydert (PhD → 2011)
Julien Labbé (PhD → 2009)
Florent Chevallier (PhD → 2007)

General activities of membres :
LAr, jet, b-tagging, computing, Top software production,
Hardware responsible for Lar barrel (2006-2007) : Benjamin Trocmé
Scientist in charge for local Tier 2 : Sabine Crépé-Renaudin
Jet-ETmiss, sub-group “software and validation” : Pierre-Antoine Delsart
Coordinatrice Top software : Annick Lleres (2009-2011)
convener single top : Arnaud Lucotte (2008-2010), Julien Donini (2010-2011)

Top analyses (on data) :
cross section single top, t-channel, W+t
search for single top s-channel
search for top+jet resonances (single top)
W polarization in top events

LPSC Grenoble : top PhD theses

Caterina Monini, *Mesure de la section efficace de production de single top en voie s auprès du LHC*, début octobre 2011, dir. A. Lucotte
Benjamin Decheneaux, *Recherche de nouvelle physique dans le canal top anti-top*, début octobre 2010, dir. S. Crépé-Renaudin et P-A Delsart
Xia Shun, *Mesure de la polarization du W dans le canal top anti-top*, début octobre 2010, dir. A. Lleres

Thomas Delemontex, *Mesure de la section efficace de production single top W+t dans le canal dilepton auprès de l'expérience ATLAS*, 5 octobre 2012, dir. A. Lucotte
Jin Wang, *Mesure de la section efficace de production du single top en voie-t en utilisant des arbres de decision avec ATLAS à sqrt(s)=7 TeV*, 29 juin 2012, dir. J. Donini, A. Lleres, C. Feng
Carole Weydert, *Recherche d'un boson de Higgs chargé avec le détecteur ATLAS : de la théorie à l'expérience*, 5 septembre 2011, dir. B. Clément
Julien Labbé, *Préparation de l'expérience ATLAS : Étalonnage électronique du calorimètre électromagnétique*, Mesure de la polarisation des bosons W dans la décroissance des quarks top, 1 juillet 2009, dir. J. Collot, B. Trocmé, B. Clément
Florent Chevallier, *Mesure de la section efficace de production de quarks top en paires dans le canal lepton+jets à D0 et à ATLAS et interprétation en terme de boson de Higgs chargé dans ATLAS*, 10 mai 2007, dir. A. Lucotte

LPSC Grenoble : performances articles and notes

ATLAS-CONF-2011-143, *b-Jet Tagging Efficiency Calibration using the System 8 Method*, B. Clément, T. Delemontex, A. Lucotte
ATLAS-CONF-2011-089, *Calibrating the b-Tag Efficiency and Mistag Rate in 35 pb^{-1} of Data with the ATLAS Detector*, T. Delemontex, A. Lucotte
ATLAS-CONF-2010-087, *Background studies for top-pair production in lepton plus jets final states in √s=7TeV ATLAS data*, B. Clément, T. Delemontex, J. Donini, A. Lleres, A. Lucotte
ATLAS-CONF-2010-087, *Properties of Jets and Inputs to Jet Reconstruction and Calibration with the ATLAS Detector Using Proton-Proton Collisions at s√=7 TeV*, B. Decheneaux, P-A. Delsart

ATL-COM-PHYS-2011-124, *b-jet Tagging for Top Physics: Perfomance studies, Calibrations and Heavy Flavor Fractions*, B. Clément, T. Delemontex, J. Donini, A. Lucotte, J. Wang, C. Weydert
ATL-PHYS-INT-2010-133, B-tagging for top physics analyses with early ATLAS data at sqrt(s) = 7 TeV, B. Clément, T. Delemontex, J. Donini, A. Lucotte

LPSC Grenoble : top articles and notes

Phys. Lett. B 716 (2012) 142-159, *Evidence for the associated production of a W boson and a top quark in ATLAS at √s = 7 TeV*, T. Delemontex, A. Lucotte
Phys. Lett. B 717 (2012) 330-350, *Measurement of the t-channel single top-quark production cross section in pp collisions at √s = 7 TeV with the ATLAS detector*, J. Donini, A. Lleres, J. Wang
Phys.Rev.Lett. 109 (2012) 081801, *Search for tb resonances in proton-proton collisions at √s = 7 TeV with the ATLAS detector*, A. Lleres, X. Sun
EPJC 71 (2011) 1577, *Measurement of the top quark pair production cross-section with ATLAS in pp collisions at √s = 7 TeV*, B. Clément, T. Delemontex, J. Donini, A. Lucotte

ATLAS-CONF-2012-136, *A search for $t\bar{t}$ resonances in the lepton plus jets final state using 4.66 fb-1 of pp collisions at √s = 7 TeV*, S. Crépé-Renaudin, B. Decheneux, P-A Delsart
ATLAS-CONF-2011-118, *Search for s-Channel Single Top-Quark Production in pp Collisions at √s = 7 TeV*, T. Delemontex, J. Donini, A. Lleres, A. Lucotte, X. Sun, C. Weydert
ATLAS-CONF-2011-104, *Search for W+t single-top events in the dileptonic channel at ATLAS*, A. Lucotte, T. Delemontex, J. Donini
ATLAS-CONF-2011-101, *Measurement of the t-channel Single Top-Quark Production Cross Section in 0.70fb^-1 of pp Collisions at sqrt(s) = 7 TeV with the ATLAS detector*, T. Delemontex, J. Donini, A. Lleres, A. Lucotte, X. Sun, C. Weydert
ATLAS-CONF-2011-088, *Observation of t Channel Single Top-Quark Production in pp Collisions at sqrts=7~TeV with the ATLAS detector*, T. Delemontex, J. Donini, A. Lleres, A. Lucotte, X. Sun, C. Weydert
ATLAS-CONF-2011-027, *Searches for Single Top-Quark Production with the ATLAS Detector in pp Collisions at sqrt(s) = 7TeV*, T. Delemontex, J. Donini, A. Lleres, A. Lucotte, X. Sun, C. Weydert
ATLAS-CONF-2010-063, *Search for top pair candidate events in ATLAS at sqrt(s)=7 TeV*, B. Clément, T. Delemontex, J. Donini, A. Lleres, A. Lucotte

Backup slides

Top quark production and decays

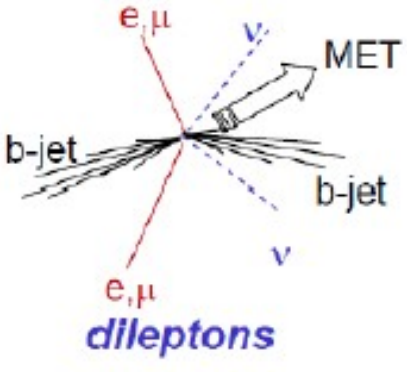
- **Production mechanism**
  - $t\bar{t}$ pair, 85% by gluon fusion, ~15% by $q\bar{q}$ production
  - single top (electroweak)

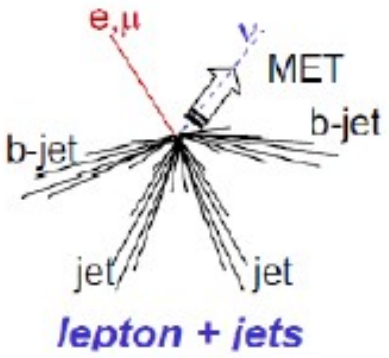
Predictions $\sqrt{s}$= 7 TeV

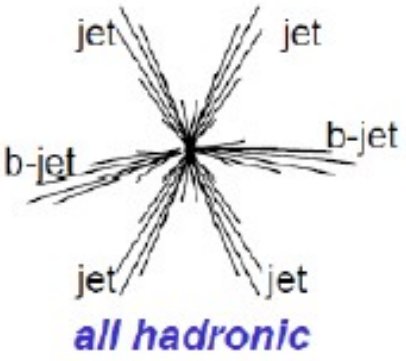
$\sigma(pp \rightarrow t\bar{t})_{NNLOapprox} = 167^{+17}_{-18}$ pb

Computed with: Aliev et. al., HATHOR, arXiv:1007:1327 (2011)

- **Top pair event classification according to W decays**







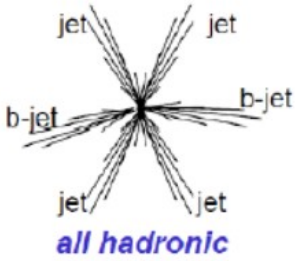
Branching ratio	4.9%	29.6%	45.7%
Final state	2 isolated leptons large E_T^{miss}	1 isolated lepton E_T^{miss}	no lepton no E_T^{miss}
	2 b-jets	2 b-, 2 light jets	2 b-, 4 light jets
Backgrounds	few (mainly Z+jets)	moderate (mainly W+jets)	huge (mainly QCD)

τ channels : 13.5% for τ+jets and 6.3% for τ+e/μ+jets

tt decay modes

General distinction according to the W± pairs decay modes

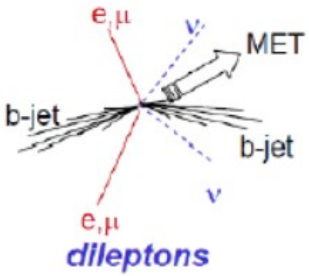
“All hadronic” 45.7% high background



$e^{\pm}\,\nu_e$ + jets 14.53 %

$\mu^{\pm}\,\nu_\mu$ + jets 14.29 %

} “lepton+jets”



$\tau^{\pm}\,\nu_\tau$ + jets 15.21 %

$e^{\pm}\,\tau^{\pm}\,\nu_\tau\nu_e$ 2.42 %

$\mu^{\pm}\,\tau^{\pm}\,\nu_\tau\nu_\mu$ 2.23 %

$\tau^{+}\,\tau^{-}\,\nu_\tau\,\nu_\tau$ 1.26 %

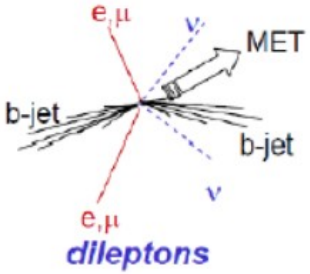
} leptonic or hadronic τ decay modes

$e^{+}\,e^{-}\,\nu_\tau\nu_\mu$ 1.15 %

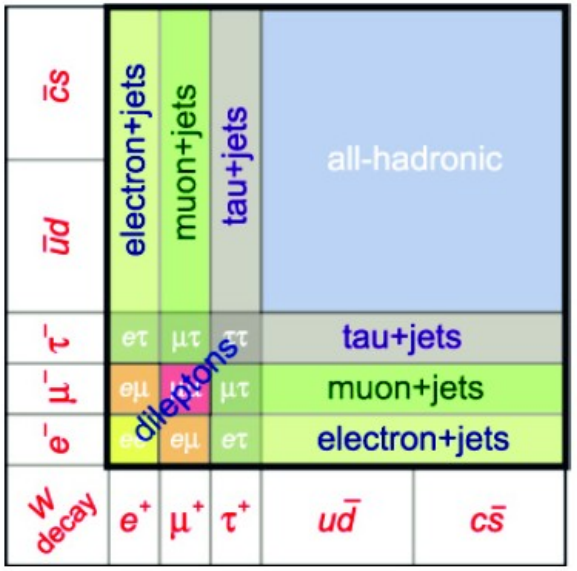
$\mu^{+}\,\mu^{-}\,\nu_\tau\nu_\mu$ 1.12 %

$e^{\pm}\,\mu^{\pm}\,\nu_\tau\nu_\mu$ 2.27 %

} Clean in terms of trigger and selection
Presence of two ν's.
Transverse mass. “dilepton”



Top pair decay channels



Plot from Angela Barbaro Galtieri et al. 2012 Rep. Prog. Phys. 75 056201

Simulation

- simulated tt events generated using MC@NLO with PDFs from CTEQ6.6 (mt ≡ 172.5 GeV); sample normalized to 164.6 pb (from NNLO prediction using [5])
  - parton showering modeled with HERWIG
  - underlying event modeled with JIMMY
- single tops generated using MC@NLO
- W/Z bosons in association with jets generated with ALPGEN interfaced to HERWIG/JIMMY with CTEQ6.1
- di-boson events generated by HERWIG with MRST2007lomod
- pile-up is simulated with a value of 4-8 interactions per bunch crossing in order to reflect what is seen in the data (2011)

Some new measurements done by ATLAS

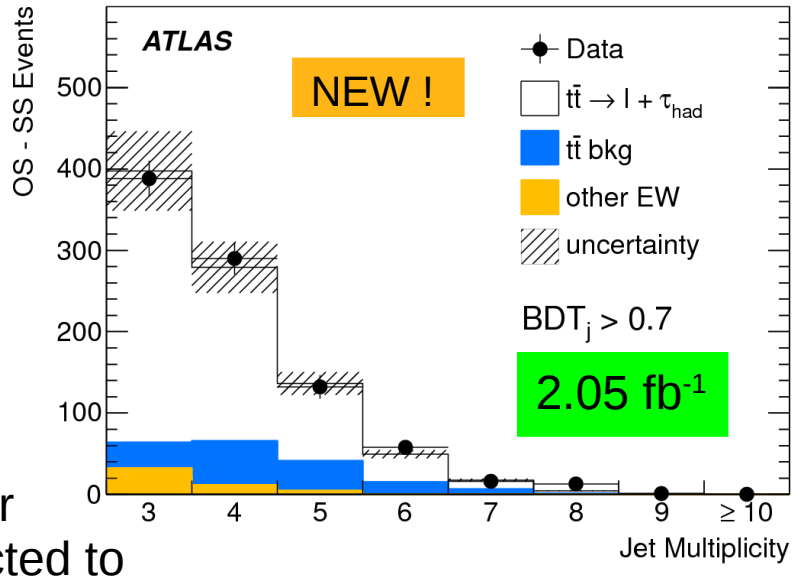
pair production with e/μ + τ + jets

arXiv 1205.2067 (2012)

BR could be enhanced by the existence of $H^{\pm}$

Signature :

1 isolated e/μ + τ + E_T^{miss} + jets (1b)



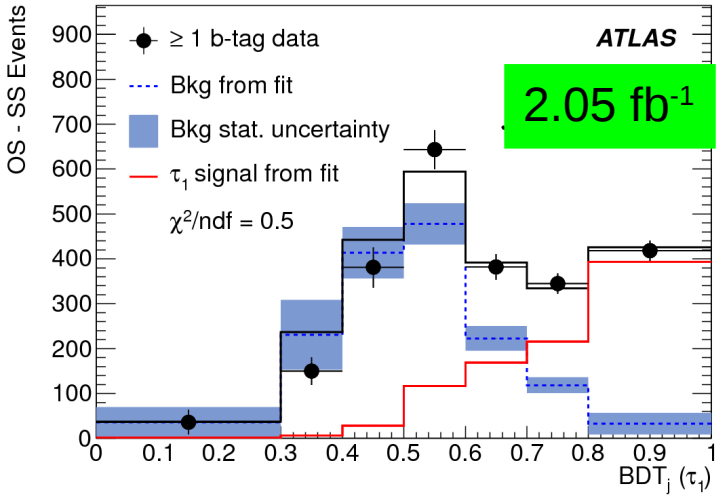
Trigger : 1 single isolated lepton

Offline : opposite sign lepton + τ

E_T^{miss}>30 GeV, $\sum E_T$>200 GeV, 2 jets at least one of them is b-tagged

Analysis Strategy : perform template fit of BDT

- background distribution is different with jet flavor
- to reduce # of templates, SS events are subtracted to remove b, gluon originated τ candidates (charge symmetric)



$\sigma_{tt}(\mu+\tau) = 186 \pm 15\ (stat) \pm 20\ (syst) \pm 7\ (lumi)$ pb

$\sigma_{tt}(e+\tau) = 187 \pm 18\ (stat) \pm 20\ (syst) \pm 7\ (lumi)$ pb

$\sigma_{tt} = 186 \pm 13\ (stat) \pm 20\ (syst) \pm 7\ (lumi)$ pb

overall precision ~14%,
limited by systematic uncertainties

Systematics : b-tag (~9 pb), τ-ID (~4 pb)

pair production in hadronic modes with τ

~10% of all tt events, BR enhanced by $H^{\pm}$

Signature :

τ_{had} + E_T^{miss} + jets (2b)

Trigger : ≥ 4 jets (p_T>10 GeV @L1),
≥ 2 b-tagged at EF

Offline : ≥ 5 jets, ≥ 2 of them b-tagged
- S_{ETmiss}> 4
- 3 jets (one is b-tagged) with highest p_T sum to be m_{top}
- select remaining non b-tagged jet with p_T > 40 GeV as τ candidate
- e/μ veto

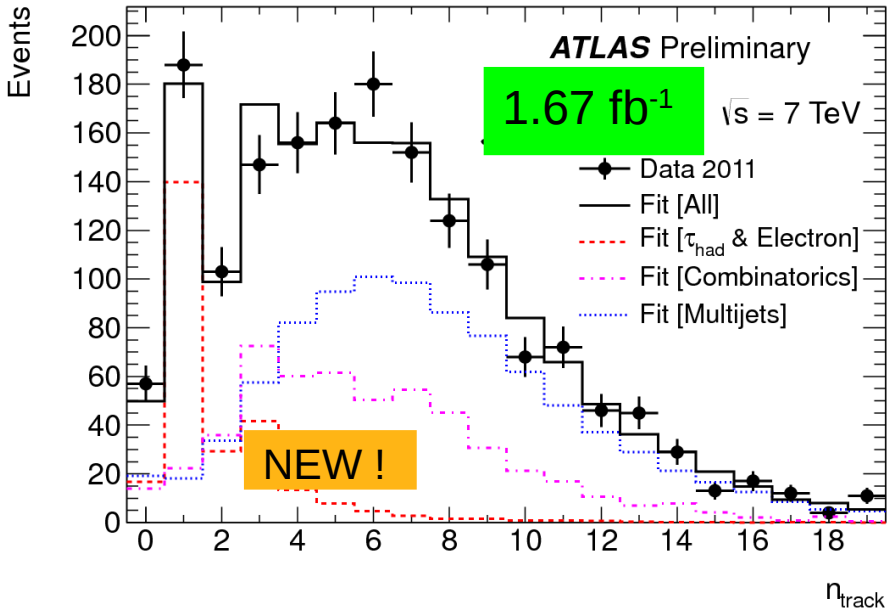
Analysis Strategy : Fit to number of good quality tracks associated to tau lepton, with 3 templates

Signal : from tt MC sample

tt combinatorics : from tt μ + jets control region

Multi-jet : from 1.5 < S_{ETmiss}< 2 control region

ATLAS-CONF-2012-032



σ_{tt}= 200 ± 19 (stat) ± 43 (syst) pb

overall precision ~23%,
limited by systematic uncertainties

Systematics : ISR/FSR (12 pb), b-tag (10 pb), Fit (7 pb)

pair production with lepton + jets + b→μX

ATLAS-CONF-2012-131

- Uncertainty on the performance of 'lifetime-based' b-taggers is typically a driving systematic for top-pair cross-section measurements
- Using a different method for identifying b-jets gives a measurement driven by a separate set of systematics

<u>Event Selection</u>

'Standard' lepton + jets selection except using:

<u>Soft Muon Tagger</u>

Exploits the b → μX decay (20% B.R.)

Standard muon cuts and:

$\Delta R(\mu, \text{jet}) < 0.5$

$|d_0| < 3$ mm

$|z_0 \sin\theta| < 3$ mm

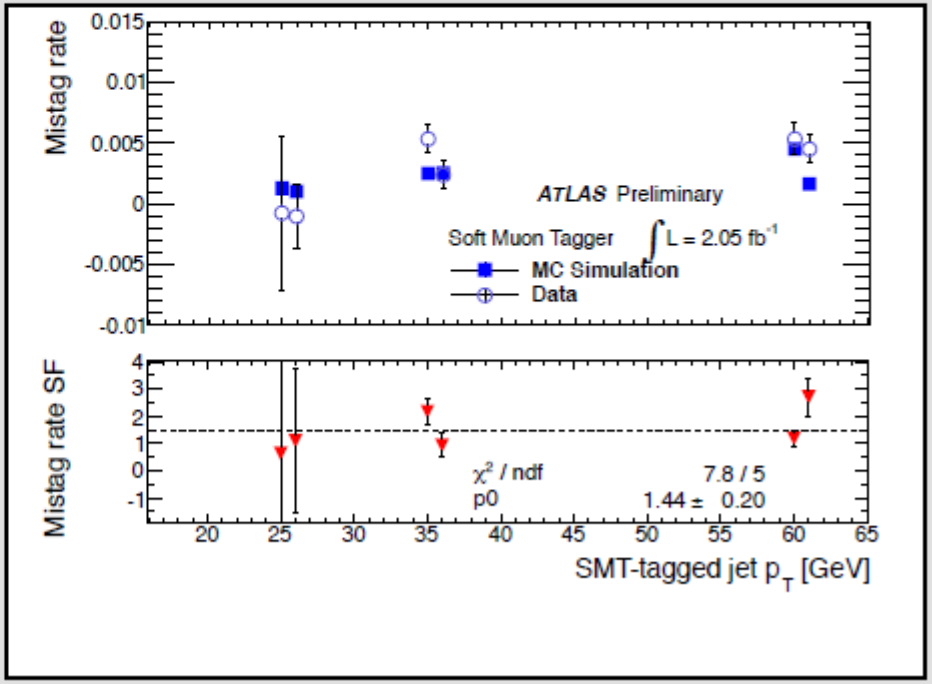
$p_T > 4$ GeV

$\Delta R(\mu_W, \mu_{SMT}) > 0.01$

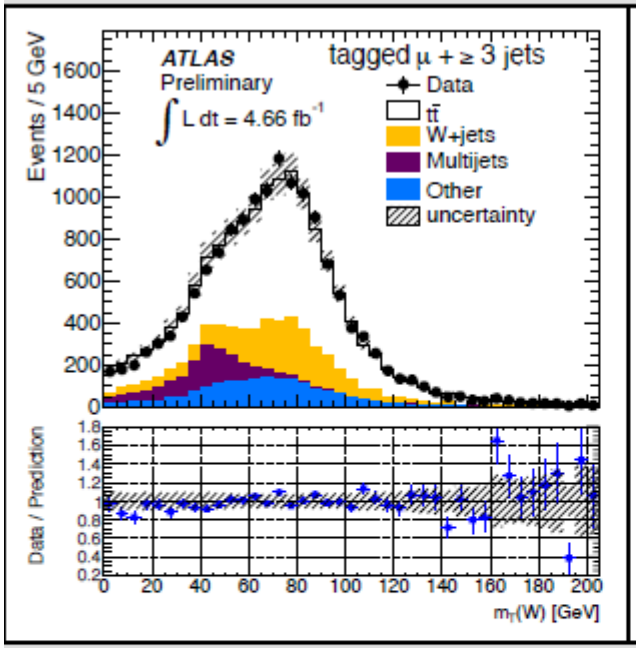
$\eta < 2.5$

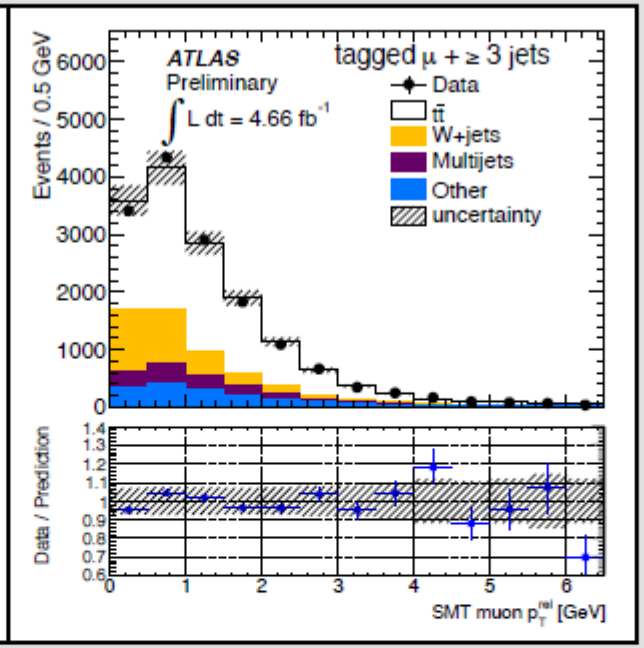
Jet track multiplicity > 3, or Jet EM Fraction < 0.8

$\chi^2_{match} < 3.2$



pair production with lepton + jets + b→μX





W+Jets and multijets are data-driven (charge asymmetry and matrix method, respectively)

Other backgrounds taken from simulation

Main contribution to systematics from background normalizations, generator uncertainties, jet energy scale and lepton identification

$\sigma_{t\bar{t}} = 165 \pm 2\ (\text{stat.}) \pm 17\ (\text{sys.}) \pm 3\ (\text{lumi.})$

See ATLAS-CONF-2012-097 for an in-situ measurement of the b-tagging efficiency using top-pair events

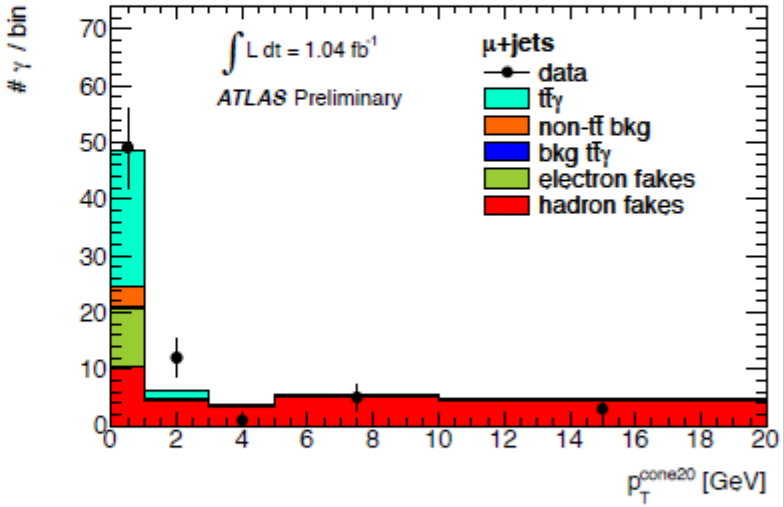
Resulting uncertainty due to the tagging efficiency is only at the ~ 1-2% level! The uncertainty due to the b branching ratio is however at the 3% level...

Measurement of $t\bar{t}\gamma$ cross section (7 TeV, 1.04 fb^{-1}, *ATLAS-CONF-2011-153*)

- Electroweak couplings of the top quark: investigating $t\bar{t}$ with an additional gauge boson, e.g. $t\bar{t}\gamma$ and $t\bar{t}Z$
- $t\bar{t}\gamma$ cross section measurement: based on a template fit using p_{T}^{cone20} distributions of photon candidates

$\Rightarrow$(p_{T}^{cone20}: $\Sigma p_{\mathrm{T}}^{track}$ in a cone with $R < 0.2$)

fit parameter	e+jets	μ+jets
hadron fakes	21 ± 6	28 ± 8
e fake γ from $t\bar{t}$	7.4 ± 1.7	10.9 ± 2.2
$t\bar{t}\gamma$ background	0.2	0.4
non-$t\bar{t}$	6.7	3.8
total background	78 ± 14	
total signal	46 ± 12	



- $\boxed{\sigma_{t\bar{t}\gamma} \cdot BR = \mathbf{2.0 \pm 0.5\ (stat) \pm 0.7 (syst) \pm 0.08 (lumi)}\ pb}$
- Consistent with the SM prediction: $2.1 \pm 0.4 pb$ (arxiv:1102.1967)

$*$ Search for $t\bar{t}Z$ production: ATLAS-CONF-2012-126

Jet multiplicity in top pair events

ATLAS-CONF-2012-155

- By measuring the cross-section as a function of the number of jets in an event, constraints can be placed on various ISR/FSR models, and generator configurations

Event Selection

'Standard' lepton + jets selection

Strategy

Count the number of jets produced in the events for 4 different thresholds:

p_T > 25, 40, 60, 80 GeV

To be able to perform precise comparisons to Monte Carlo, the distributions are then 'unfolded' to truth 'particle-level'

Compare data to 4 different models

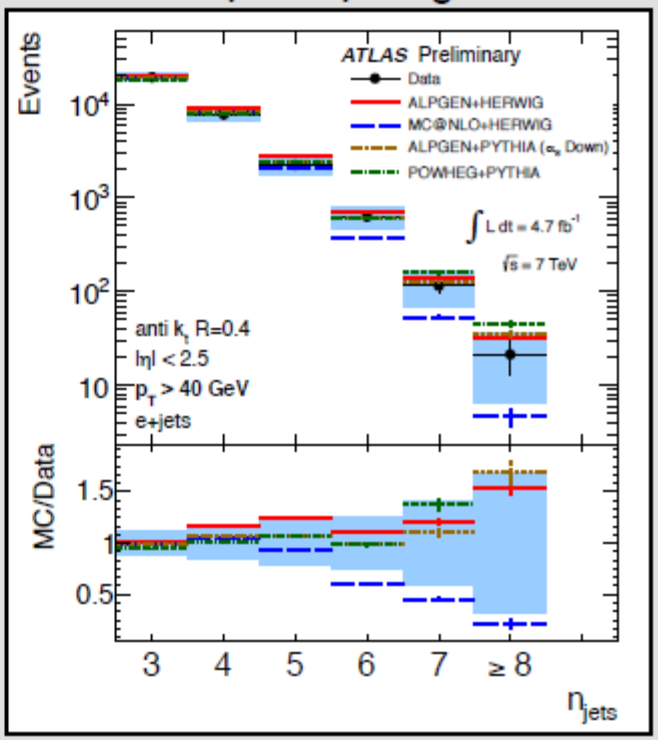
ALPGEN+HERWIG

MC@NLO+HERWIG

ALPGEN+PYTHIA (with as variations)

POWHEG+PYTHIA

After unfolding



Proper understanding of the agreement between the various models and the data can lead to reduced uncertainties in future top measurements!

pair production with lepton + jets (8 TeV)

ATLAS-CONF-2012-149

- Same method as for the last public 7 TeV results...
- Template fit, using a likelihood discriminant based on the product of the PDF for 2 variables, taken from simulations of the signal (tt) and background (W+jets)

<u>Event Selection</u>

Use single lepton triggers

At least 3 jets, p_T > 25 GeV and $|\eta|$ < 2.5

p_T (e, μ) > 40 GeV (pile-up robustness)

e-channel:

E_T^{miss} > 30 GeV and m_T > 30 GeV

mu-channel:

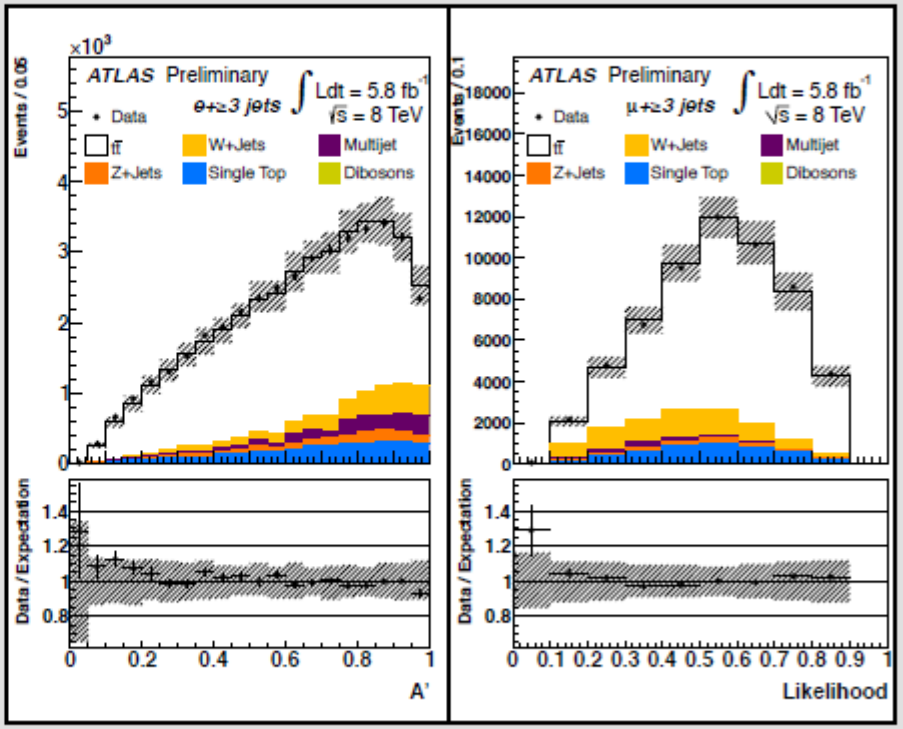
E_T^{miss} > 20 GeV and (E_T^{miss} + m_T) > 60 GeV

<u>Likelihood uses</u>

Event aplanarity A'

Lepton η

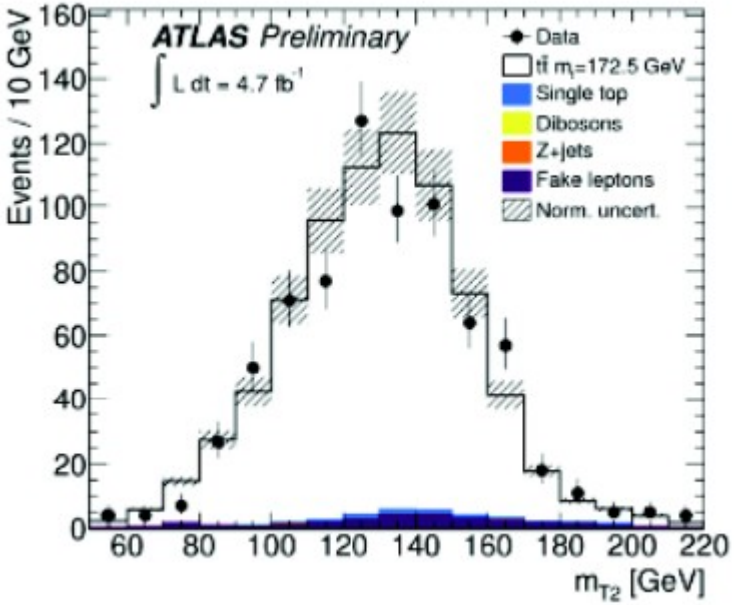
Systematics dominated by the modeling of the $t\bar{t}$ acceptance in simulation



$\sigma_{t\bar{t}}$ = 241 ± 2 (stat.) ± 31 (sys.) ± 9 (lumi.)

Top mass measurement : dilepton channel

- **Neutrino method** ATLAS-CONF-2012-082
  - pair lepton and b-jets
  - calculate their « visible invariant mass »
  - split the missing transverse momentum into two possible neutrinos
  - calculate the transverse mass for each possible neutrino pT value
  - take the minimum of the two possible mT
  - take the minimum over the lepton and the b-jet pairing. This is the transverse mass mT in case of two neutrinos (mT2)
  - calibration curve from MC
  - main systematic uncertainties from JES, b-JES, tt modelling



$m_{top} = 175.2 \pm 1.6\ (stat)^{+3.1}_{-2.8}\ (syst)$ GeV

Top pair spin correlation

- **Motivation**
  - $t\bar{t} \rightarrow l^+\nu b, l^-\nu \bar{b}$ produce charged leptons possessing correlations in azimuthal angle $\Delta\phi$
- **Strategy**
  - the degree of spin correlation in $t\bar{t}$
  - $A_{meas} = A_{SM} \times f_{SM}$
  - the fit includes a linear superposition : $f_{SM} \times$ (SM prediction) + $(1\text{-}f_{SM}) \times$ (uncorrelated model)
  - the four dilepton channels fitted simultaneously to get a common f_{SM}

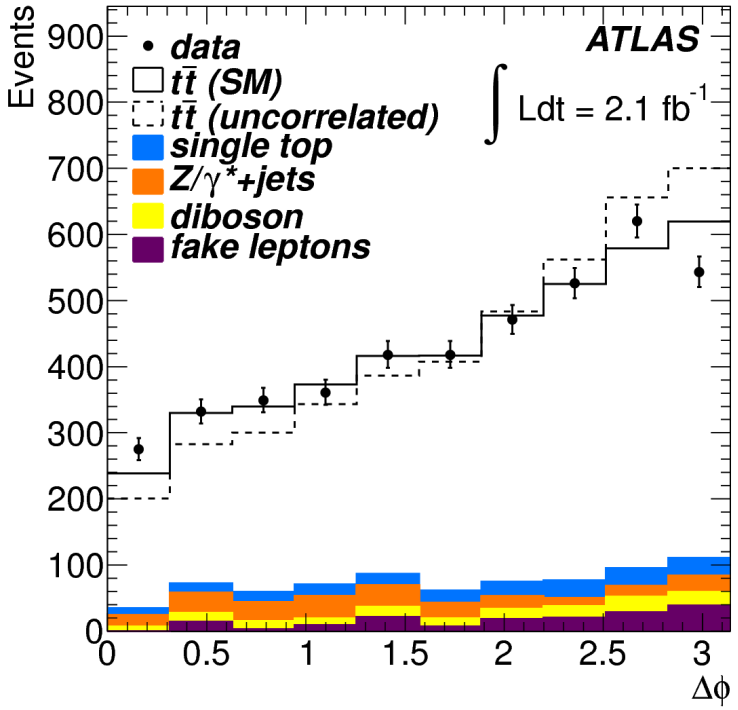
$$f_{SM} = 1.30 \pm 0.14\,(stat)\,^{+0.27}_{-0.22}\,(syst)$$

$$A_{meas} = 0.40 \pm 0.04\,(stat)\,^{+0.08}_{-0.07}\,(syst)$$

  - zero $t\bar{t}$ spin correlation is excluded with a significance of 5.1σ

$$A \equiv \frac{N(\uparrow\uparrow)+N(\downarrow\downarrow)-N(\uparrow\downarrow)-N(\downarrow\uparrow)}{N(\uparrow\uparrow)+N(\downarrow\downarrow)+N(\uparrow\downarrow)+N(\downarrow\uparrow)}$$

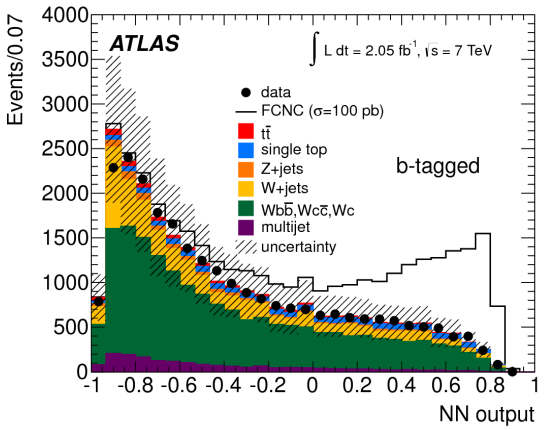
PRL 108, 212001 (2012)

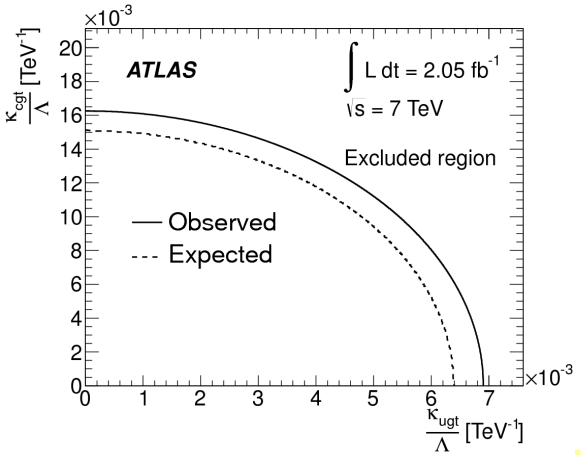


Search for FCNC (single top production)

- **Motivation**
  - in SM, FCNC processes forbidden at tree level and suppressed at higher orders
  - BSM with new sources of flavour predict higher rates
- **Strategy**
  - a single top production search : $qg \rightarrow t \rightarrow W(\rightarrow l\nu)b$, where q=u, c
  - signature : 1 isolated e/μ + ETmiss + 1 b-jet
  - fit to NN distribution
  - first measurement of FCNC with top production at LHC, most stringents upper limits on the coupling constants and branching ratios

PLB 712 (2012) 351-369





$\sigma_t(qg \rightarrow t) \times BR(t \rightarrow Wb) < 3.9$ pb @95% CL

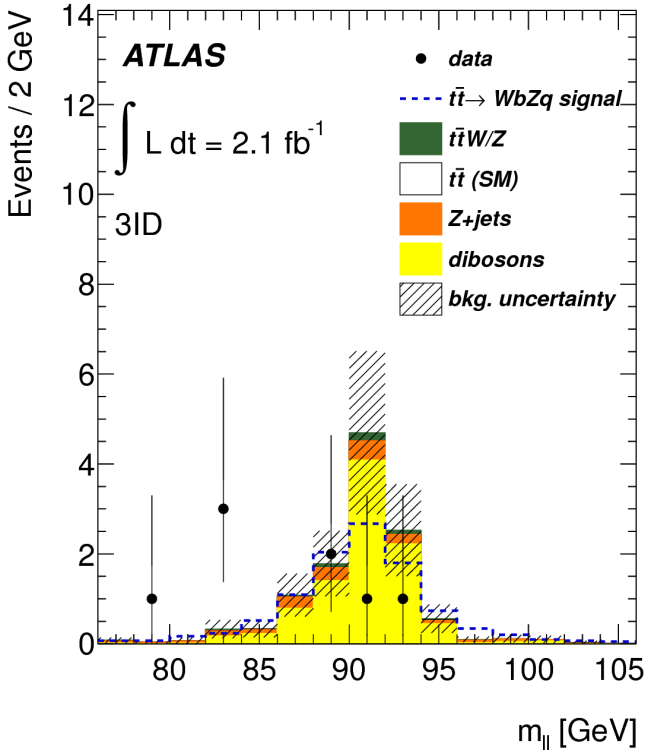
$\kappa_{ugt}/\Lambda < 6.9 \times 10^{-3}$ TeV^{-1}

$\kappa_{cgt}/\Lambda < 1.6 \times 10^{-2}$ TeV^{-1}

Search for FCNC (in top decays)

- **Motivation**
  - The top quark FCNC decay branching ratio (BR) in several SM extensions is typically many orders of magnitude higher than the SM BR
  - BSM with new sources of flavour predict higher rates
- **Strategy**
  - a search for $tt \to ZqWb \to llql\nu b$, where q=u, c
  - selection : 3 identified leptons (3ID) or 2 identifed leptons and 1 track (2ID+TL)
  - The expected and observed 95 % CL upper limits on the FCNC top quark decay $t \to Zq$ BR

JHEP09 (2012) 139



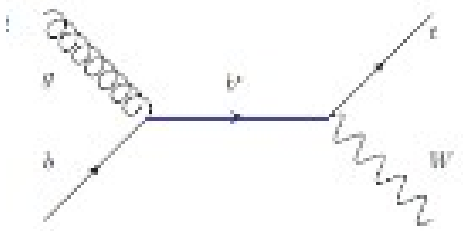
channel	observed	(-1σ)	expected	$(+1\sigma)$
3ID	0.81%	0.63%	0.95%	1.4%
2ID+TL	3.2%	2.15%	3.31%	4.9%
Combination	0.73%	0.61%	0.93%	1.4%

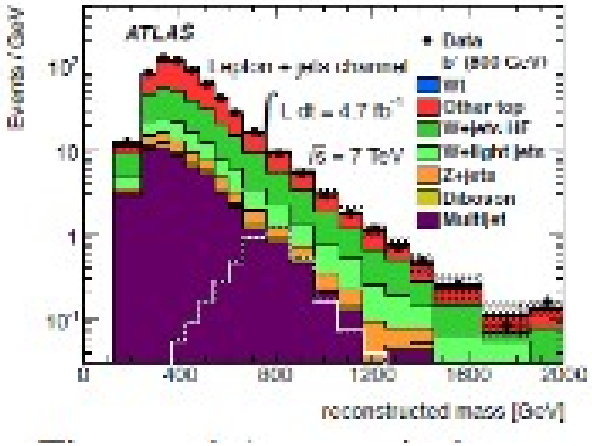
Search for new heavy quarks

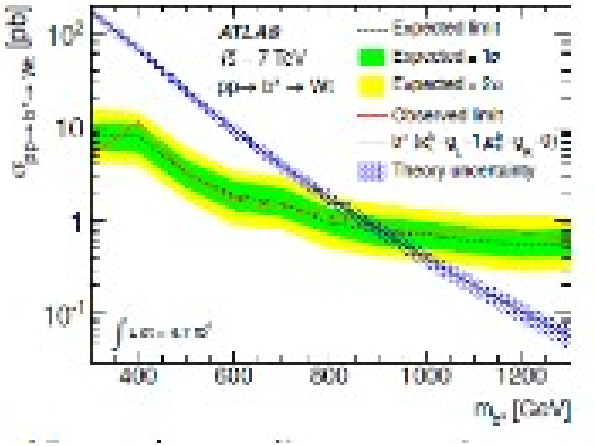
- **Motivation**
  - first search for excited-quarks coupling to the third generation of SM quarks

Subm. PLB 8/1/2013

- **Strategy**
  - search for b*→Wt in l+jets and dilepton
  - also sensitive for b* at high mass







  - the search is general, three specific b*-quark coupling scenarios
  - limits shown for purely left-handed couplings and unit strength chromomagnetic coupling

Lower limits observed of 870 GeV