

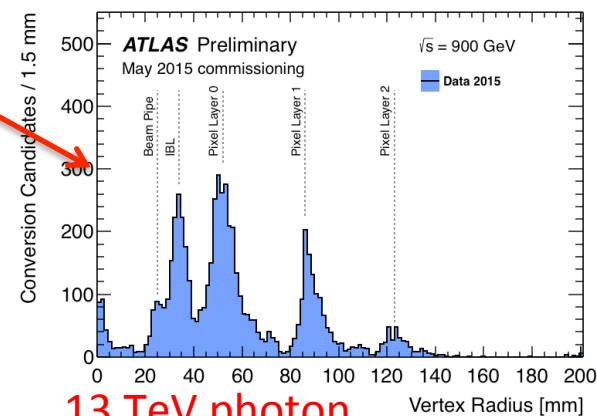
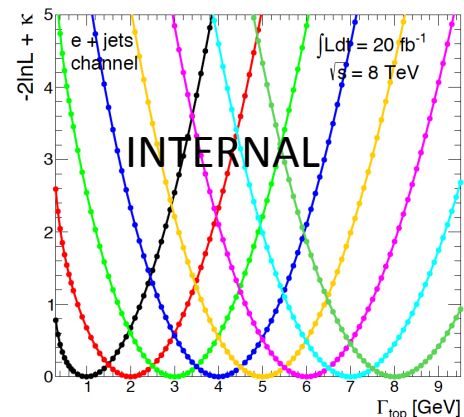
# ATLAS Data Analysis 2014-2015

## PhD completion:

- **Benedict Allbrooke:**  $WH \rightarrow l\nu bb$
- **Javier Murillo Quijada:** Top quark width
- **Richard Mudd:**  $H \rightarrow 4l$  (submitted)

## Positions of responsibility (physics/performance):

- **Ludovica:**  $H \rightarrow 4l$  analysis contact, electron/photon SW co-ordinator (from 1/10/15), W,Z SM sub-group convenor (from 1/10/15)
- **Andy C.:** Quarkonium convenor (from 1/4/15), UK B physics convenor, Inner Detector material sub-group convenor
- **Simon H.:** Top reconstruction convenor (up to 1/4/15), Top properties convenor (from 1/4/15)
- **Paul T.:** W/Z-jets taskforce co-ordinator
- **Kostas:** UK Physics convenor
- **Miriam:** Quarkonium convenor (up to 1/4/15)
- **Richard M.:** ATLAS-CMS Higgs coupling comb. contact
- Plus many paper editors and ed. boards....



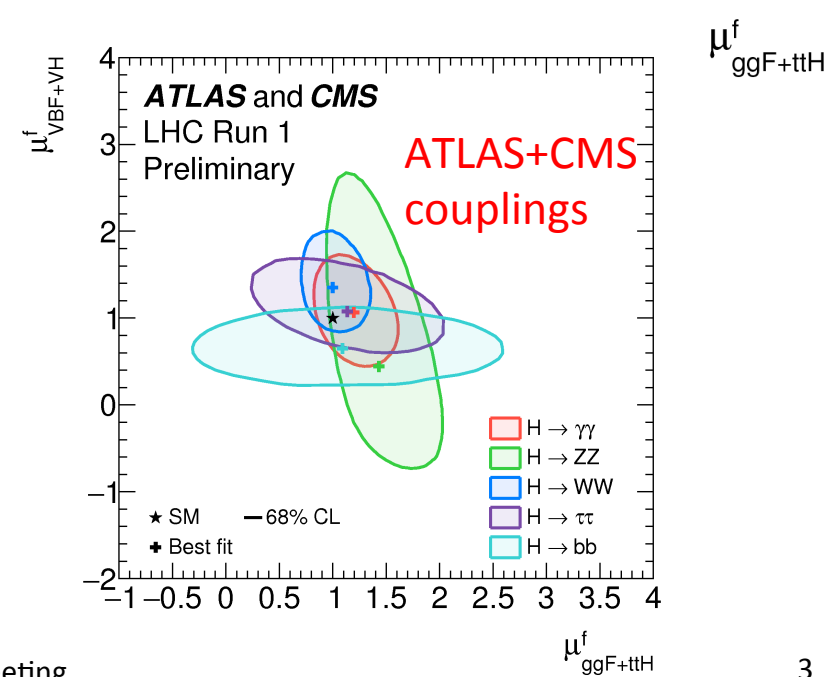
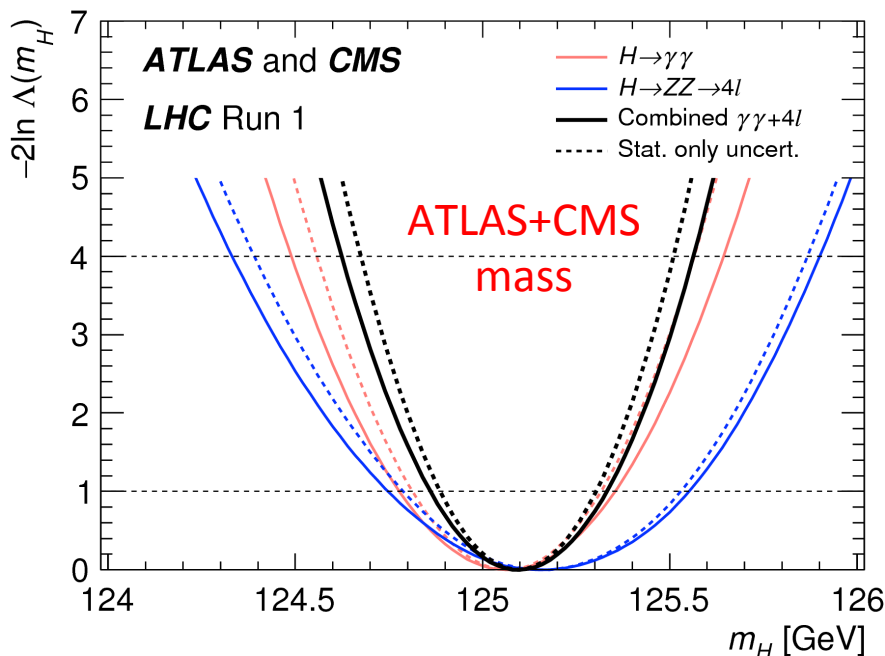
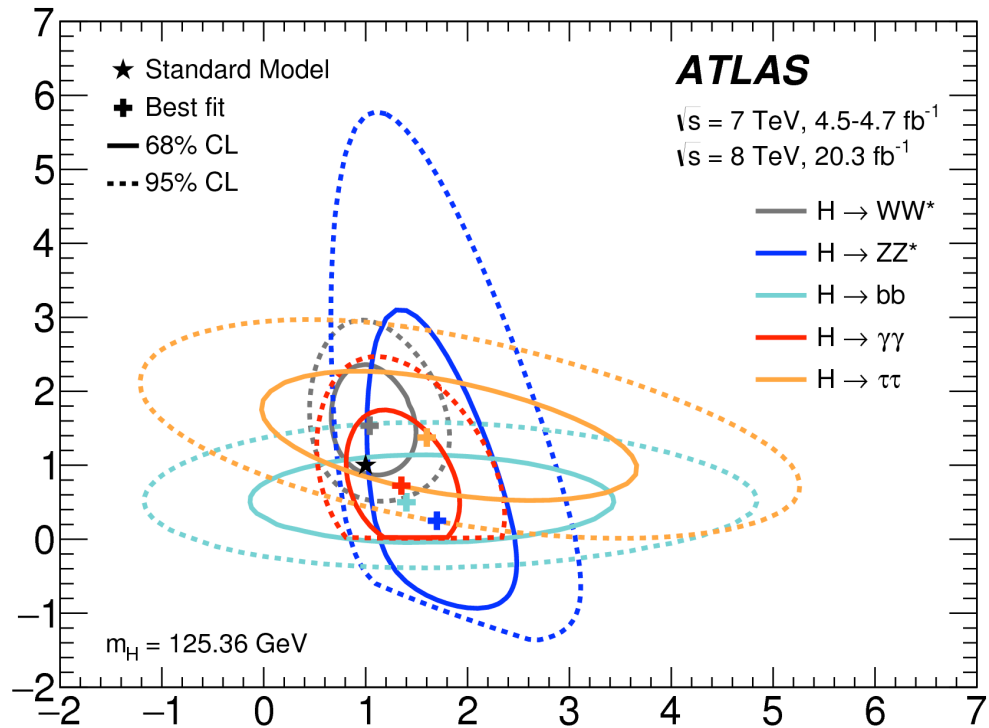
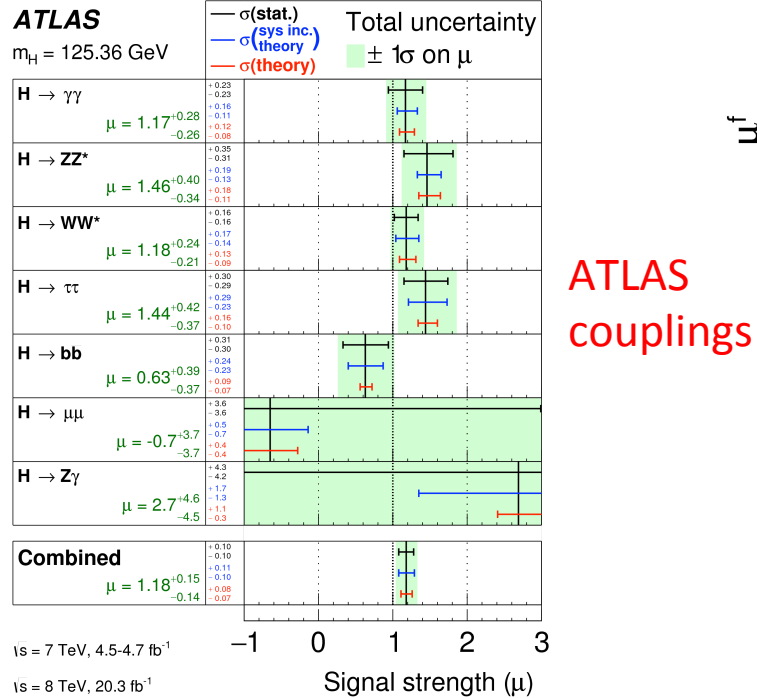
13 TeV photon  
conversion analysis

# Higgs and Standard Model physics

People: Kostas, Paul T., Ludovica, Andy C., Benedict, Richard M., Andrew D., Rhys, Alan

Higgs and BSM Higgs topics **using  $H \rightarrow 4l$  and others**:

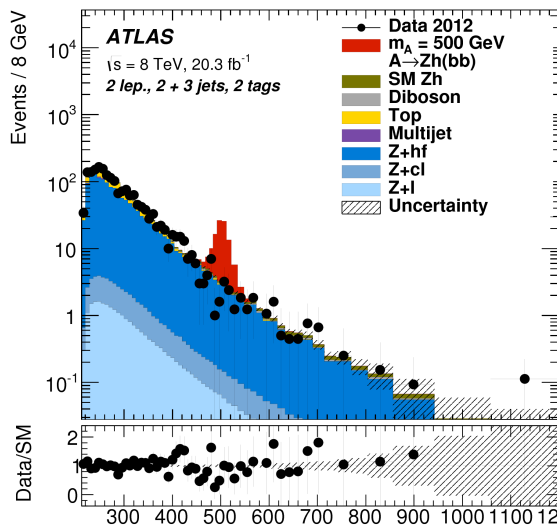
- Spin and parity of the Higgs boson [arXiv:1506.05669](#)
- Constraints on the off-shell Higgs signal strength [Eur. Phys. J. C \(2015\) 75:335](#)
- Search for new light gauge bosons in Higgs boson decays [arXiv:1505.07645](#)
- Measurements of Higgs production and couplings  
[Phys. Rev. D 91, 012006 \(2015\)](#)
- Combined measurement of the Higgs Boson mass [Phys. Rev. Lett. 114, 191803](#)
- Measurements of Higgs production, decay rates, coupling strengths  
[arXiv:1507.04548](#)
- Constraints on new phenomena via Higgs boson couplings [arXiv:1509.00672](#)
- Measurements of the Higgs boson production and decay rates and constraints on its couplings from a **combined ATLAS and CMS analysis**  
[ATLAS-CONF-2015-044](#)



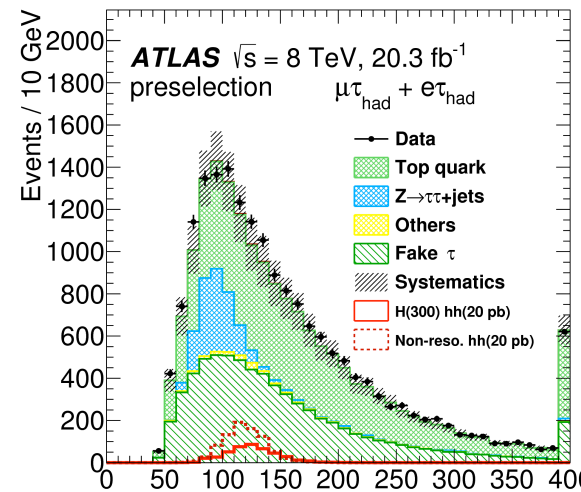
# Higgs and Standard Model physics cont'd

## Higgs to $bb, \tau\tau$ :

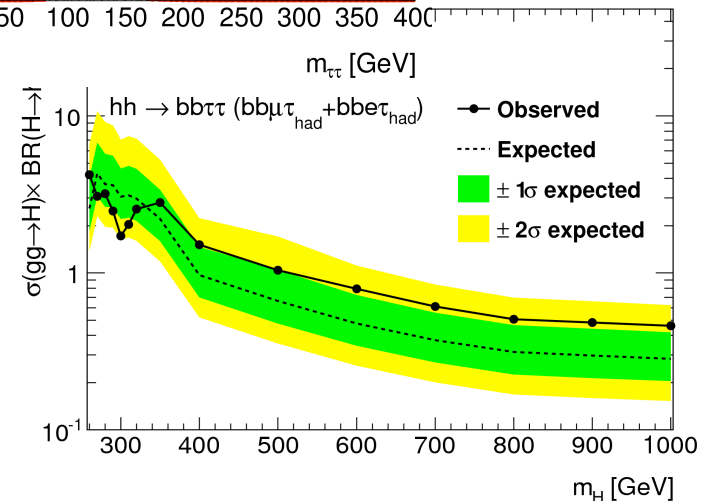
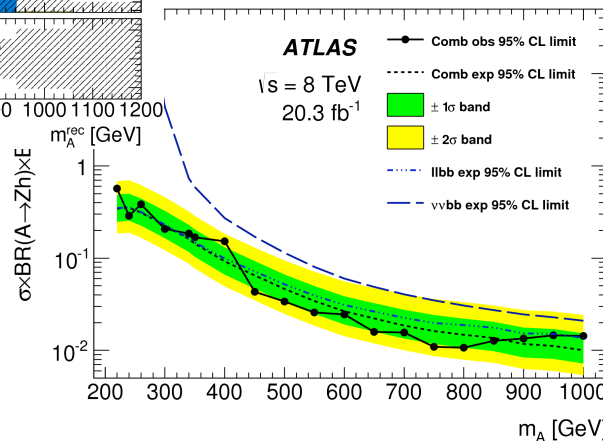
- Search for a CP-odd Higgs boson decaying to  $Zh(\rightarrow bb)$   
[Phys Lett. B744 \(2015\) 163](#)
- Searches for Higgs boson pair production in  $hh\rightarrow bb\tau\tau\dots$  channels  
[arXiv:1509.04670](#)



$A \rightarrow Zh \rightarrow llbb$



$hh \rightarrow bb \tau\tau$

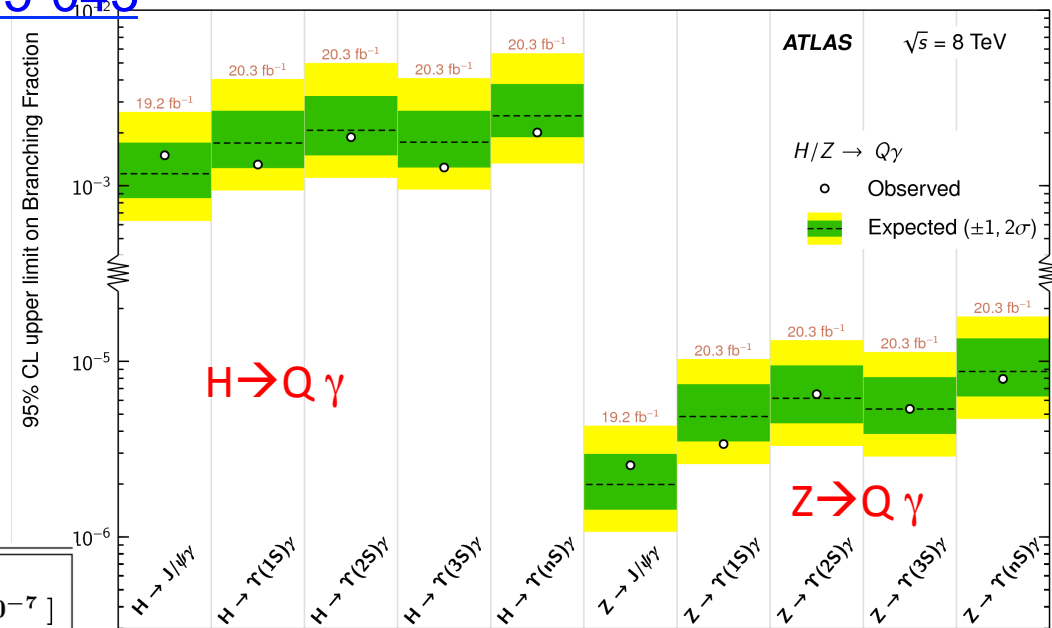


# Higgs and Standard Model physics cont'd

## Higgs to quarkonia:

- Search for Higgs and Z Boson Decays to  $J/\psi \gamma$  and  $Y(nS) \gamma$   
[Phys. Rev. Lett. 114 \(2015\) 121801](#)
- Search for the Standard Model Higgs and Z Boson decays to  $J/\psi \gamma$ : HL-LHC projections [ATL-PHYS-PUB-2015-043](#)

### Branching ratio limits at 300, 3000 fb<sup>-1</sup>

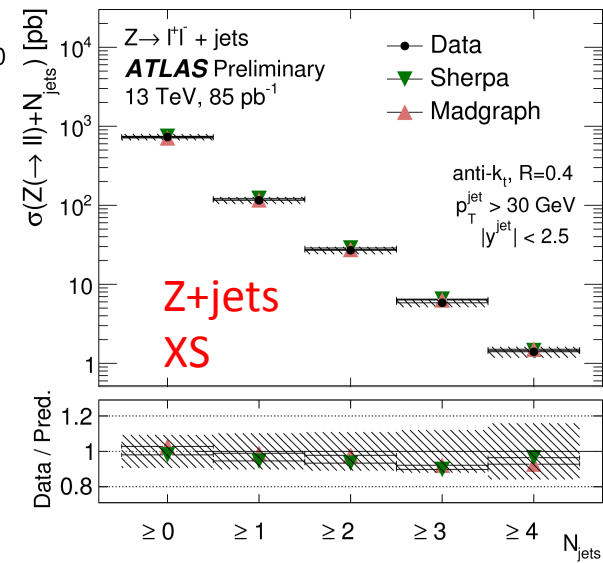
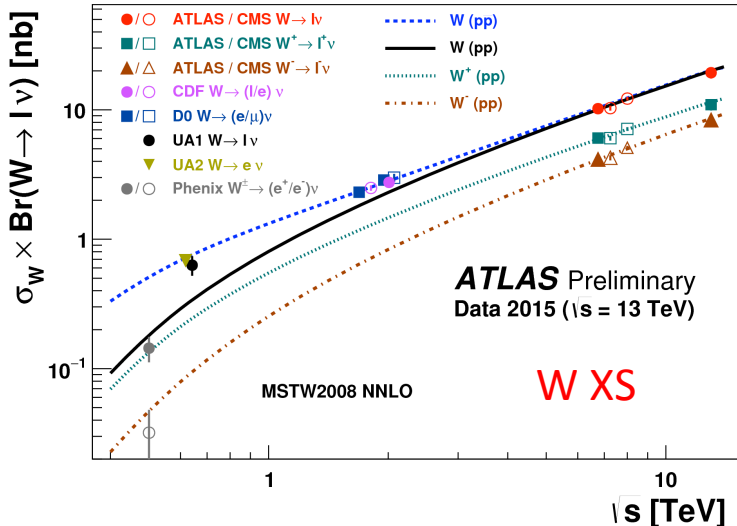
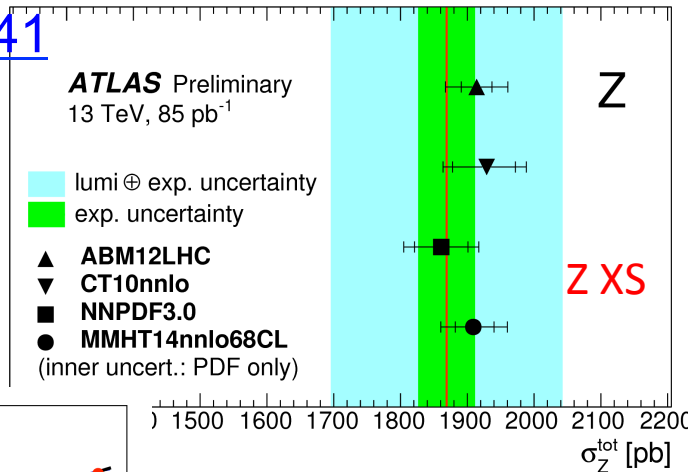


	Expected branching ratio limit at 95% CL		
	$\mathcal{B}(H \rightarrow J/\psi\gamma) [10^{-6}]$		$\mathcal{B}(Z \rightarrow J/\psi\gamma) [10^{-7}]$
	Cut Based	Multivariate Analysis	Cut Based
300 fb <sup>-1</sup>	185 <sup>+81</sup> <sub>-52</sub>	153 <sup>+69</sup> <sub>-43</sub>	7.0 <sup>+2.7</sup> <sub>-2.0</sub>
3000 fb <sup>-1</sup>	55 <sup>+24</sup> <sub>-15</sub>	44 <sup>+19</sup> <sub>-12</sub>	4.4 <sup>+1.9</sup> <sub>-1.1</sub>
Standard Model expectation			
	$\mathcal{B}(H \rightarrow J/\psi\gamma) [10^{-6}]$		$\mathcal{B}(Z \rightarrow J/\psi\gamma) [10^{-7}]$
	2.9 ± 0.2		0.80 ± 0.05

# Higgs and Standard Model physics cont'd

## Standard Model cross-sections:

- Measurement of **W and Z Boson Production Cross Sections** at 13 TeV  
ATLAS-CONF-2015-039
- Measurement of the Production Cross Sections of **Z+Jets** at 13 TeV  
ATLAS-CONF-2015-041



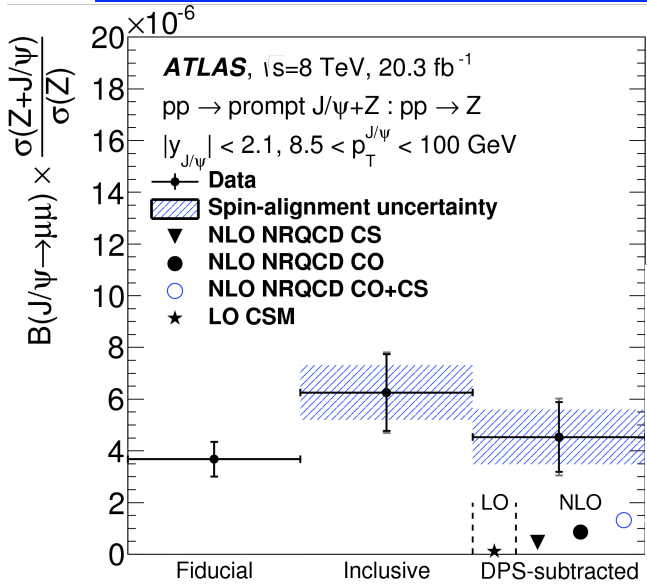
# Top and Heavy Flavour physics

People: Simon, Andy C., Miriam, Juergen, Javier, Mark L., Chris, John

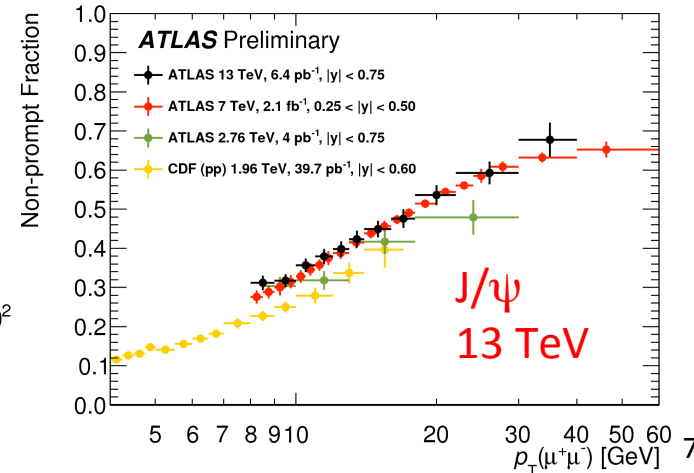
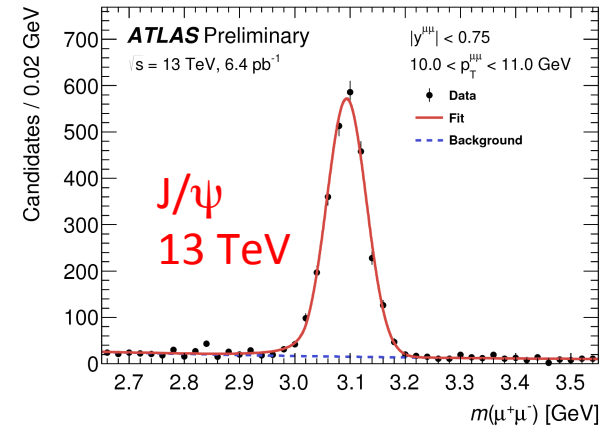
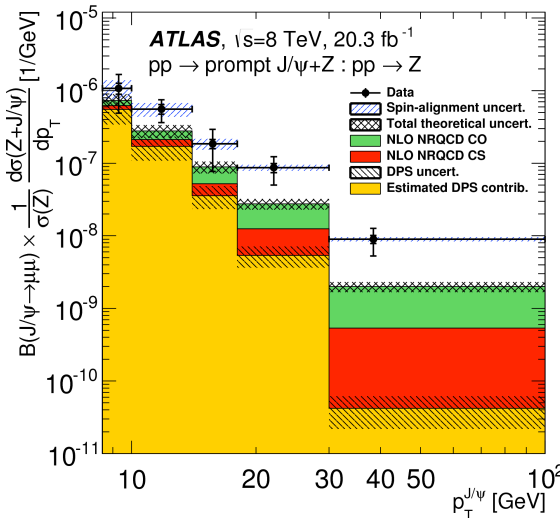
Heavy flavour topics:

- Associated production of prompt and non-prompt  $J/\psi$  and  $Z$   
[Eur. Phys. J. C75 \(2015\) 229](#)
- Differential non-prompt  $J/\psi$  production fraction at 13 TeV  
[ATLAS-CONF-2015-030](#)

Plus  
 $H, Z \rightarrow Q \gamma$



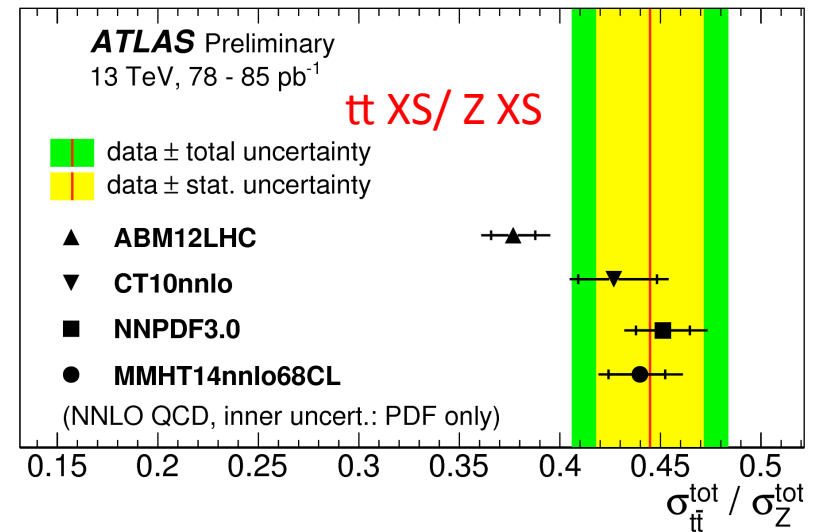
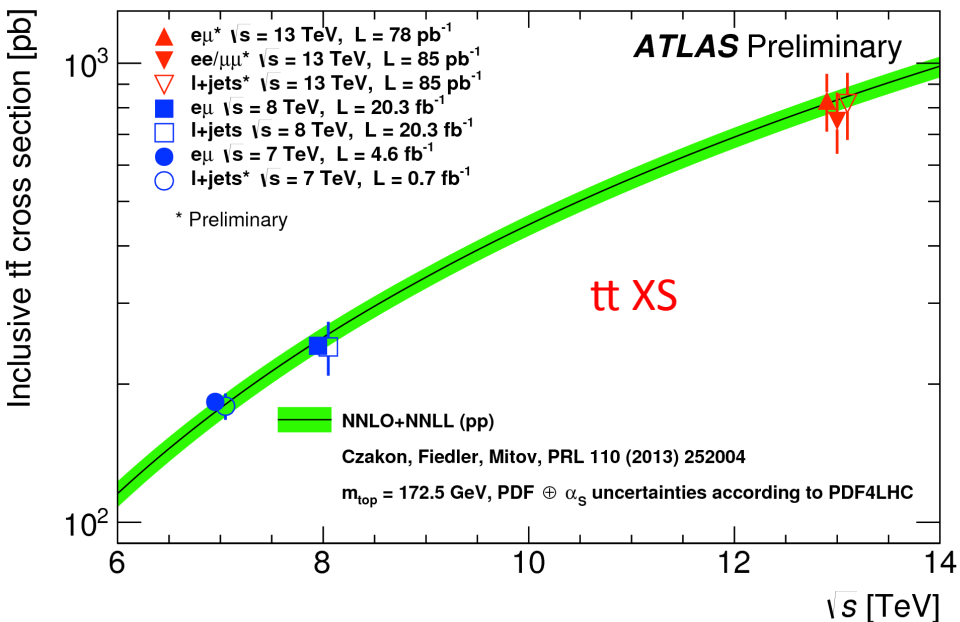
$Z+J/\psi$



# Top and Heavy Flavour physics

## Top quark topics:

- Measurements of the  $t\bar{t}$  production cross-section and  $t\bar{t}/Z$  ratio at 13 TeV ATLAS-CONF-2015-049
- Measurement of the correlations between the polar angles of leptons from top quark decays *paper in final sign-off*
- Top quark width (thesis completed)
- Top quark spin correlations (thesis in preparation)





# QCD and ALFA physics

People: Grzegorz, Paul N., Andy F., (Hardeep)

## Topics:

- Dijet production in 7 TeV pp collisions with large rapidity gaps *paper in final sign-off*
- Proton-tagged single diffraction
- Commissioning ALFA far-forward detectors and analysis of data

## ALFA

