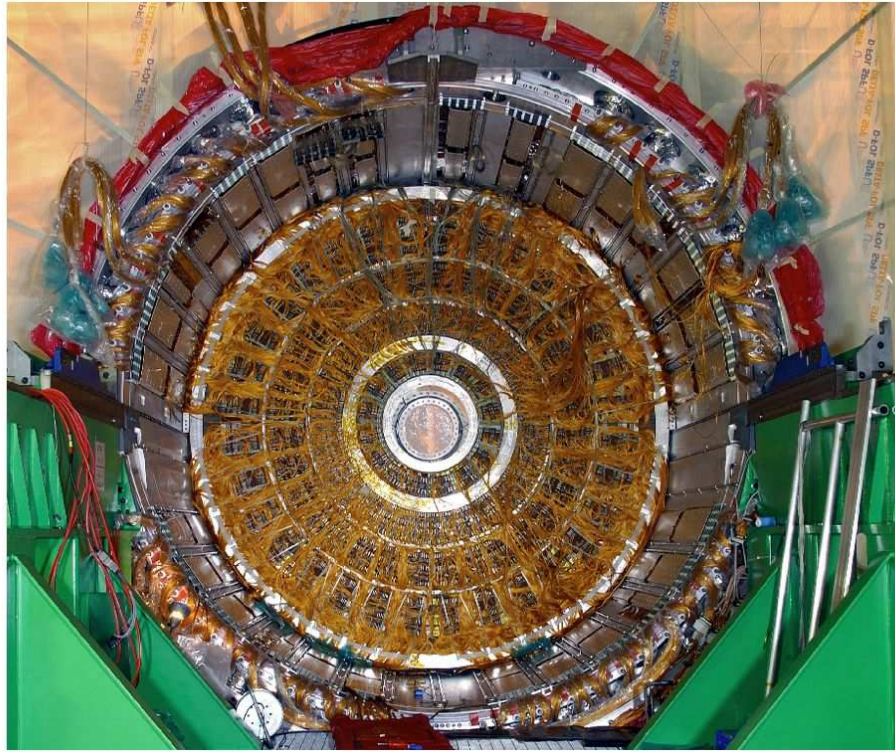


ATLAS group at Universidad Autonoma de Madrid

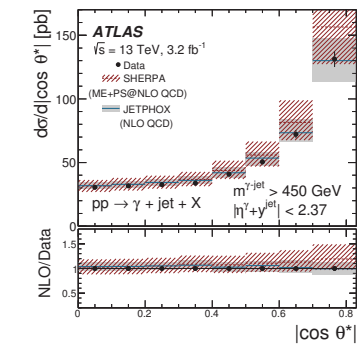
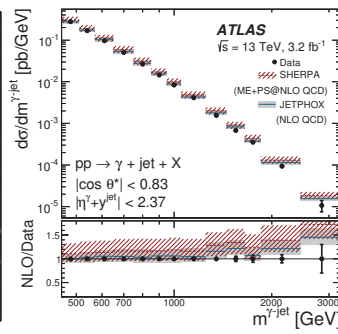
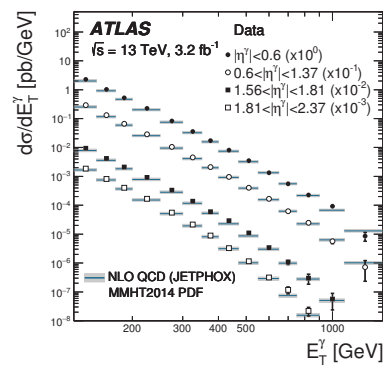
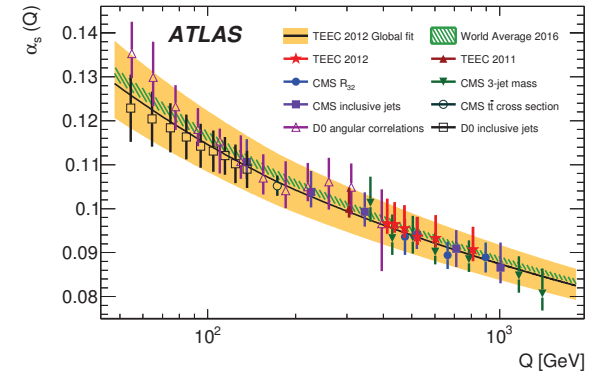
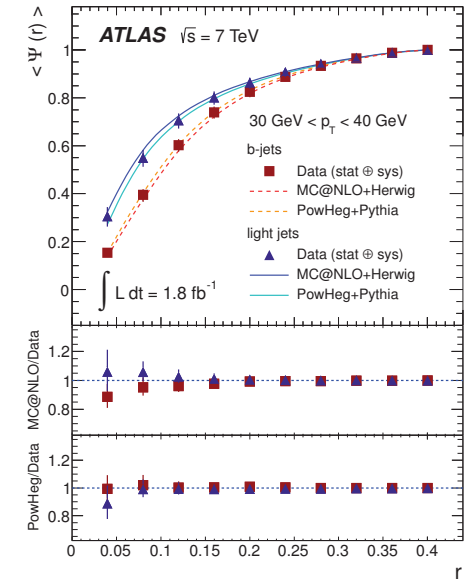
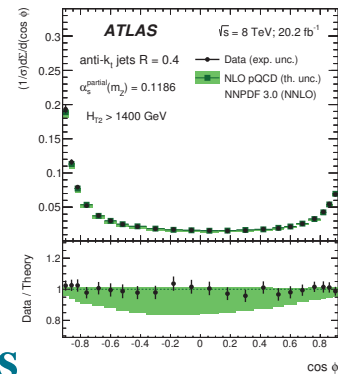
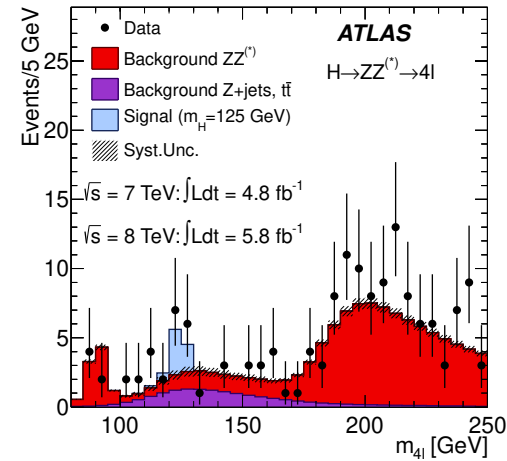


Project: Study of proton-proton collisions at 13 TeV with the ATLAS detector

4 seniors and 3 PhD students

Construction of liquid-Argon endcap electromagnetic calorimeter

Analysis: Higgs, top, QCD



Plans for the Run3 of the LHC (I)

- Operation and maintenance of the ATLAS LAr electromagnetic calorimeter
- Jet calibration: in situ determination of the jet energy scale and resolution using $\gamma + \text{jet}$ events
- QCD Analyses: further research on transverse energy-energy correlations in multijet events aiming at tests of NNLO QCD predictions and determination of the strong coupling at the highest energies plus tests of the running of $\alpha_S(Q)$
- Electroweak Analyses: measurements of inclusive photon, photon+jet, photon+2jet and $\gamma\gamma + 2\text{jet}$ production
 - tests of (N)NLO QCD+Electroweak predictions
 - measurements in a large range of E_T^γ and different photon-jet configurations to provide further experimental input for the determination of the proton PDFs
 - measurements of $\gamma + 2\text{jet}$ at large Δy_{jj} and m_{jj} to extract the contribution of vector boson fusion and set constraints on (the relevant) EFT operators
 - measurements of $\gamma\gamma + 2\text{jet}$ with focus on the regime of vector boson scattering to extract the electroweak contribution and perform EFT interpretations

Plans for the Run3 of the LHC (II)

- **Top Analyses:** measurements of single-, double- and triple-differential cross sections for $t\bar{t}$ and $t\bar{t} + \text{jet}(s)$ production in the one-lepton channel ($\ell = e, \mu$)
 - measurements of kinematical, jet and pseudotop variables
 - 3D measurements in $(y^{t\bar{t}}, m_{t\bar{t}}, n_{\text{jet}})$ useful to provide experimental input to constrain specially the gluon density in the proton
 - characterization of the additional jets and study of the correlations in $t\bar{t} + \text{jet}(s)$ events for jet multiplicities equal to five or six
 - tests of (N)NLO QCD predictions and potential to improve the determination of the strong coupling and the top quark mass
- **Searches:** searches for physics beyond the Standard Model in photon+jet events; looking for new resonances such as excited quarks (in quark compositeness models) or new mass states predicted by models (AAD and RS) with extra dimensions
 - searching for peaks in the distribution of the invariant mass of the photon–jet system
 - searching for deviations in the angular distribution ($\cos \theta^*$) of the photon–jet system with respect to the Standard Model predictions

P. Azzi et al, arXiv:1902.04070
 ATLAS Coll., ATL-PHYS-PUB-2018-051

Some prospects for HL-LHC

- Inclusive isolated photon production in pp collisions assuming $L = 3 \text{ ab}^{-1}$
 - sizeable extension in E_T^γ , up to 3.5 TeV in the region $|\eta^\gamma| < 0.6$
 - extension into regions where different PDF sets differ most
- ⇒ tests of SM at higher E_T^γ plus

extra input for improving PDF

- Isolated photon+jet production in pp collisions assuming 3 ab^{-1}
 - sizeable extension in p_T^{jet} up to 3.5 TeV
 - access to much larger invariant masses of the γ -jet system, $m^{\gamma\text{-jet}}$ up to 7 TeV

