

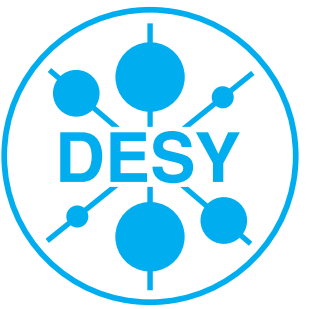


The Higgs boson, dark matter, and the ATLAS detector.

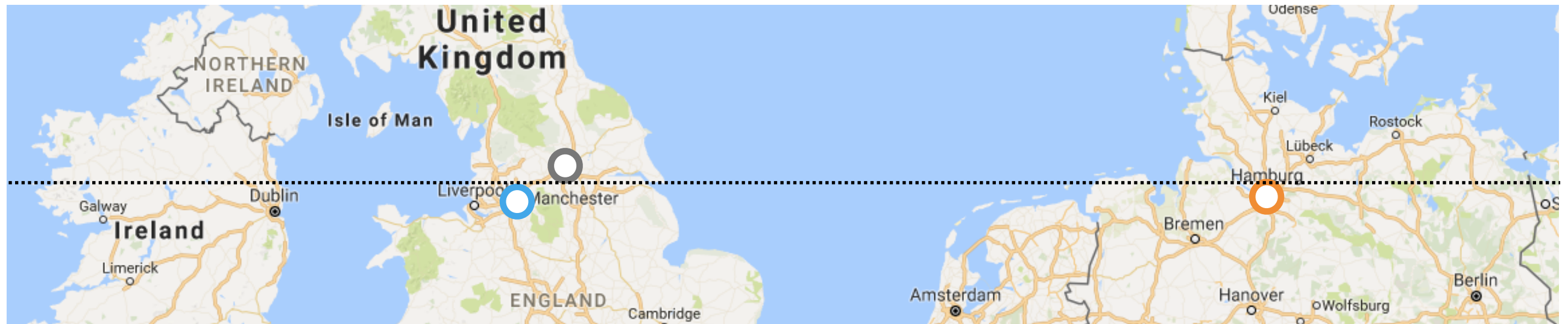
Michaela Queitsch-Maitland

DESY FH fellows meeting

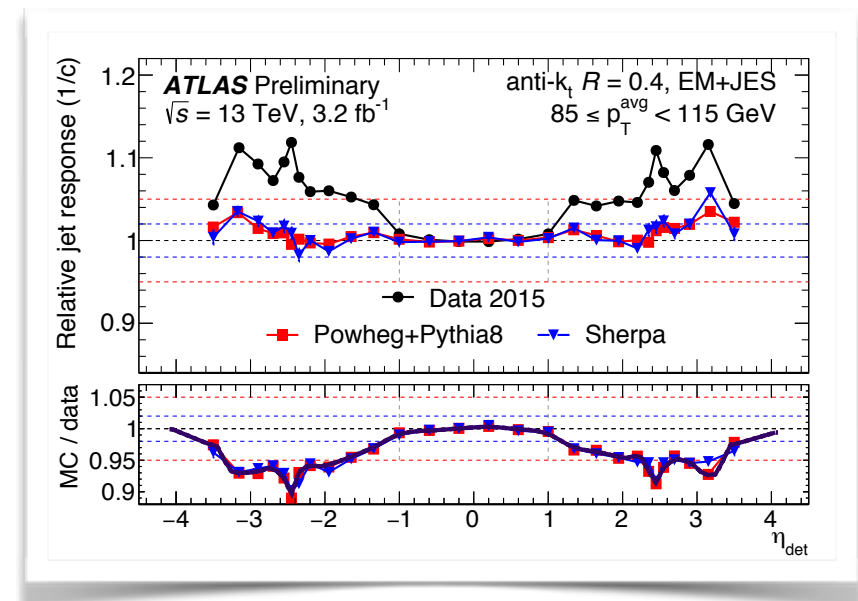
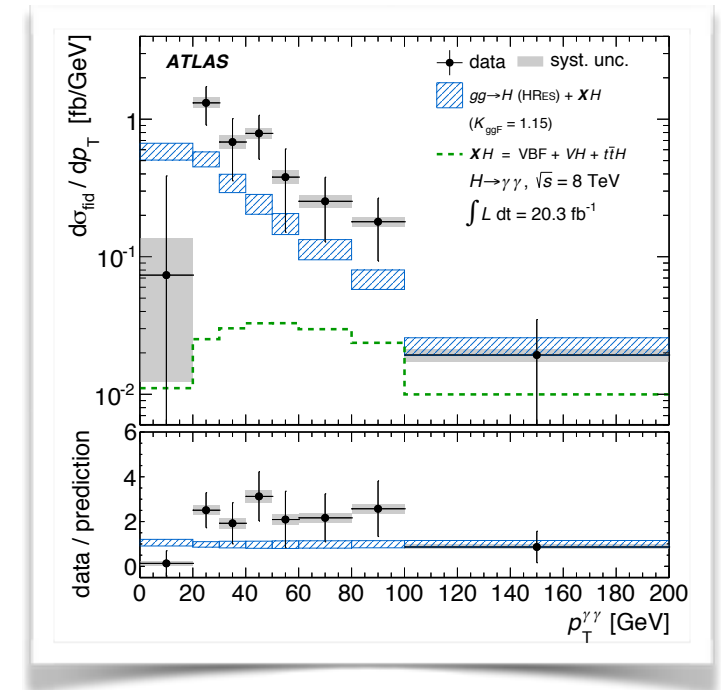
29th November 2016



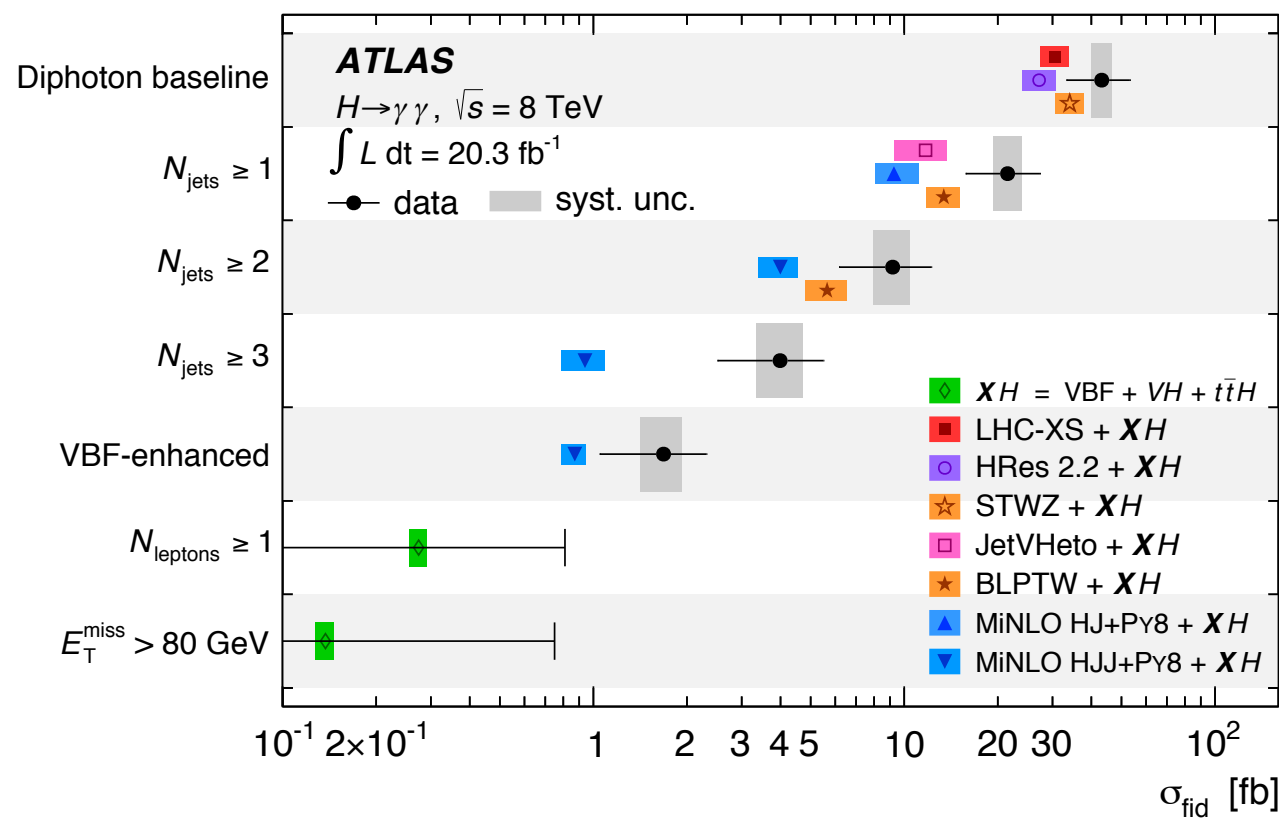
- Born and raised in Yorkshire, England.
- PhD on the ATLAS experiment in University of Manchester (2012-2016).
- Started as a fellow in the DESY ATLAS group in June.



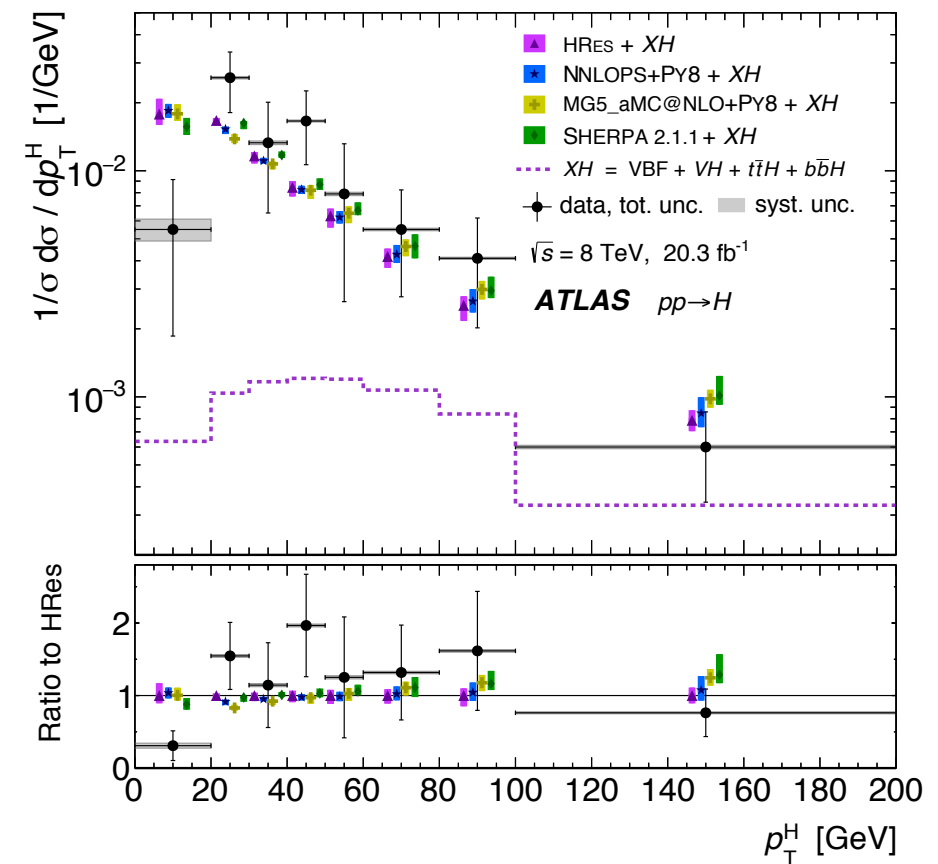
- Measurements of fiducial and differential cross sections for Higgs boson production.
 - JHEP09(2014)112
 - Phys. Rev. Lett. 115 (2015) 091801
 - Physics Letters B 753 (2016) 69-85
 - ATLAS-CONF-2015-060
 - ATLAS-CONF-2015-069
 - arXiv:1610.07922
- *In-situ* calibration of the forward jet energy scale using dijet events.
 - ATLAS-CONF-2015-017
 - JETM-2016-010



- First measurements of fiducial and differential cross sections for $pp \rightarrow H \rightarrow \gamma\gamma$.
- Total and differential cross sections combined with $H \rightarrow ZZ^* \rightarrow 4l$ decay channel.

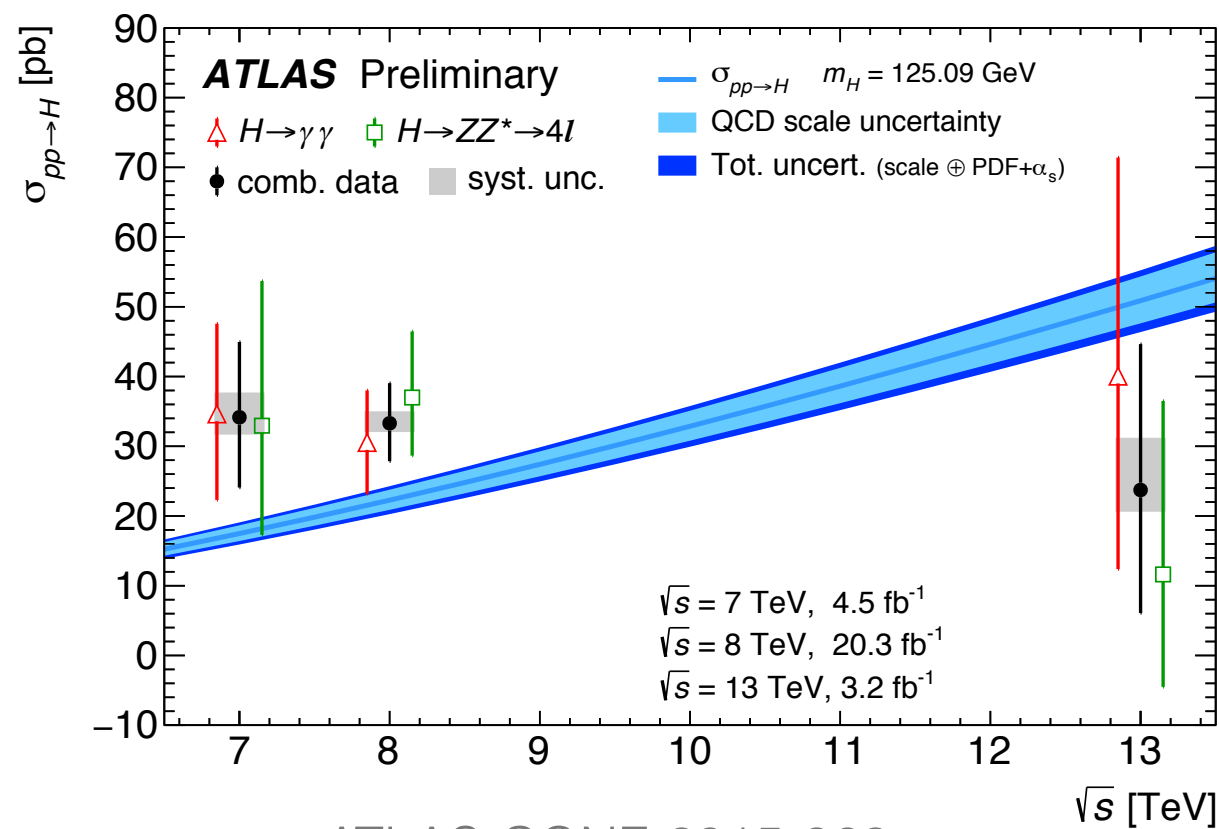


JHEP09(2014)112

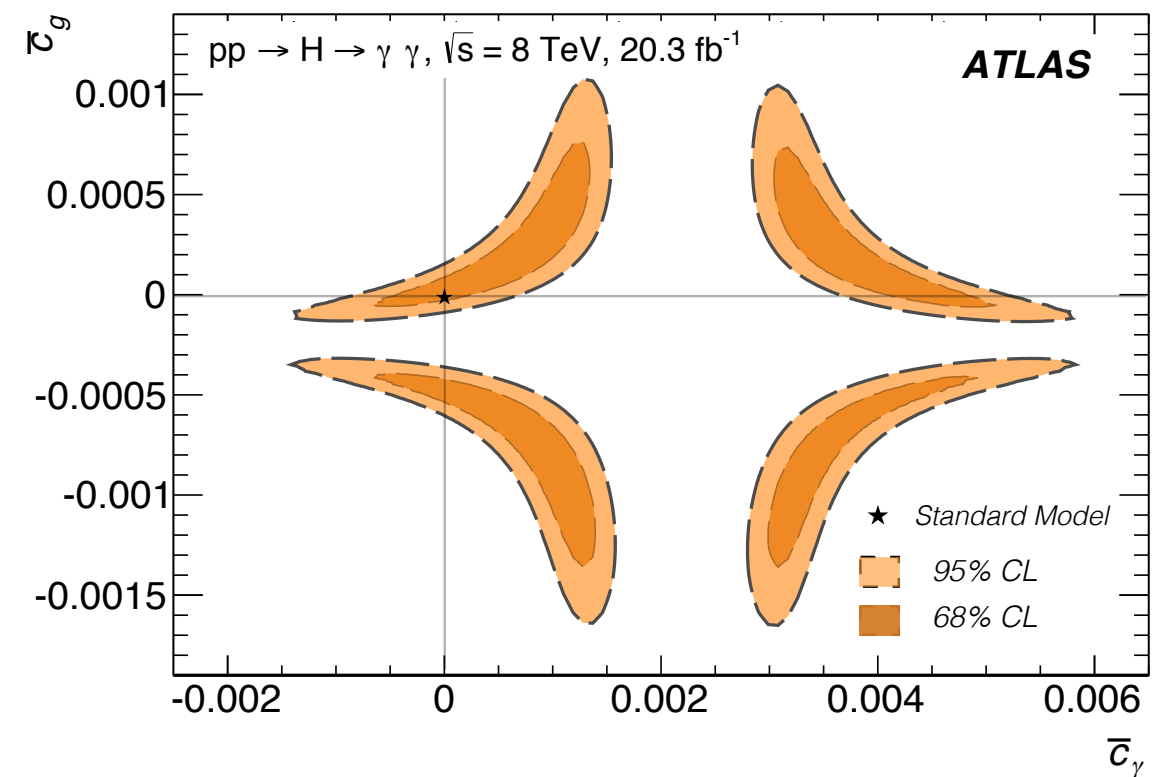


Phys. Rev. Lett. 115 (2015) 091801

- Centre-of-mass energy dependence on production cross section.
- Set limits on Higgs Effective Field Theory (HEFT) parameters.

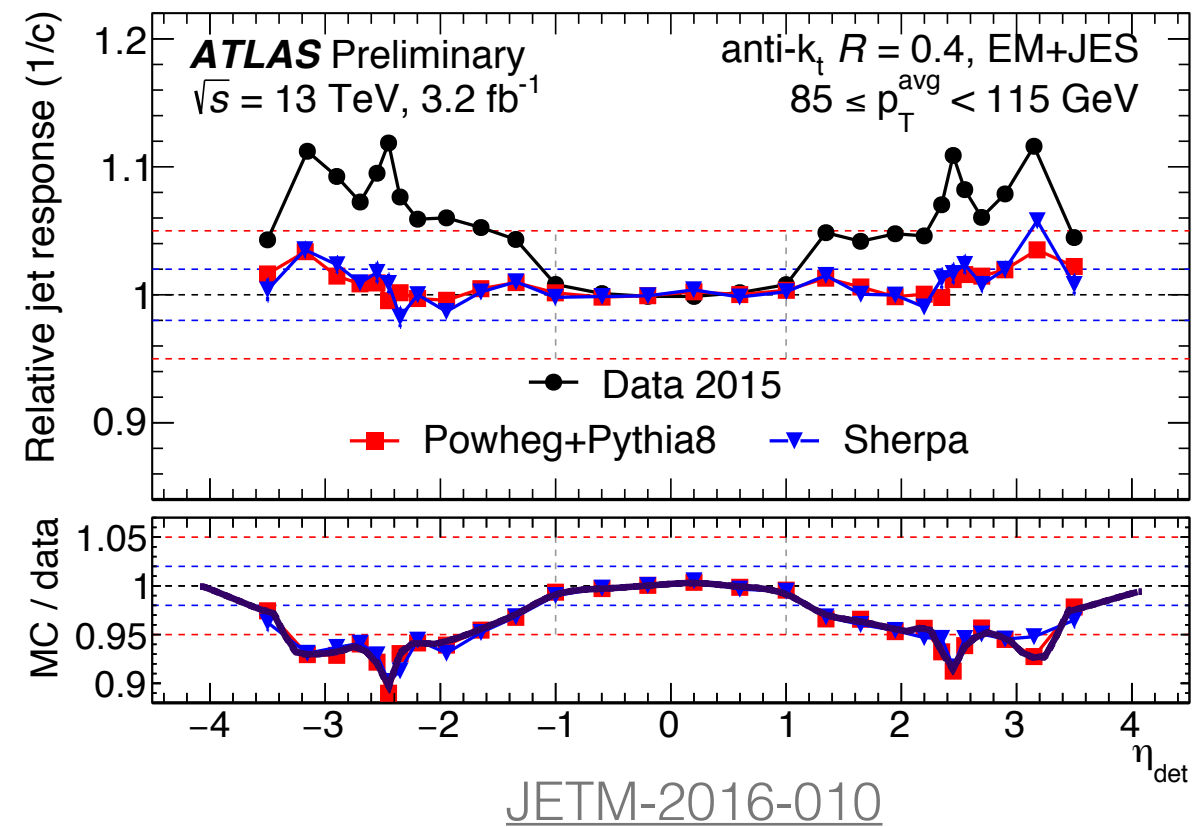
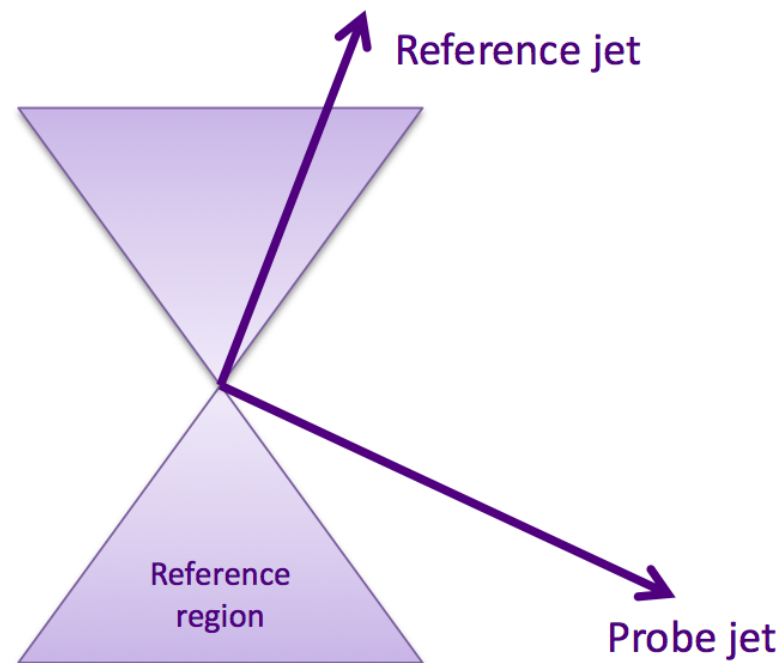


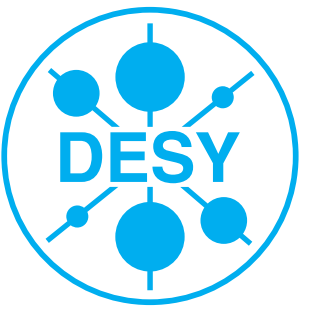
ATLAS-CONF-2015-069



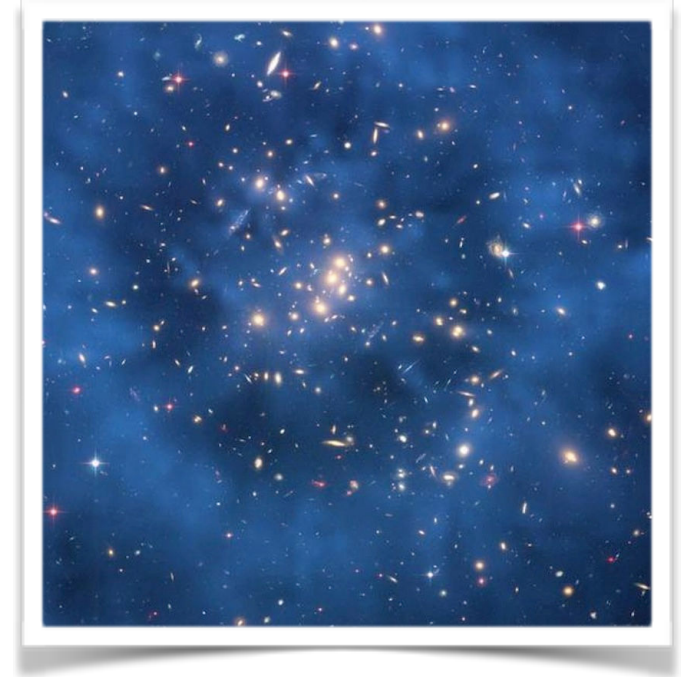
Physics Letters B 753 (2016) 69-85

- Validate MC-based jet energy scale in data using dijet events in the forward region.
- Response of *probe* jet measured relative to well-measured *reference* jet.

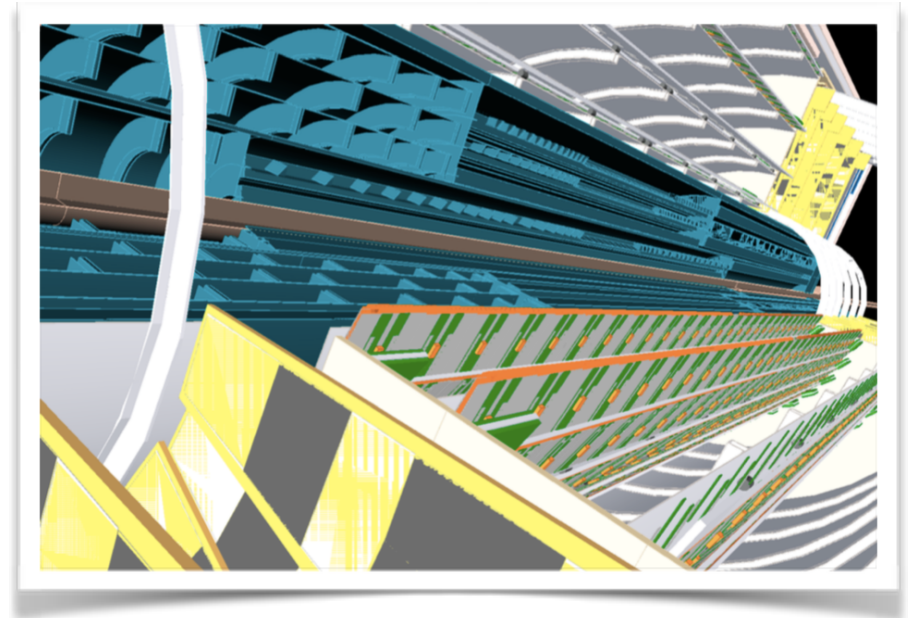




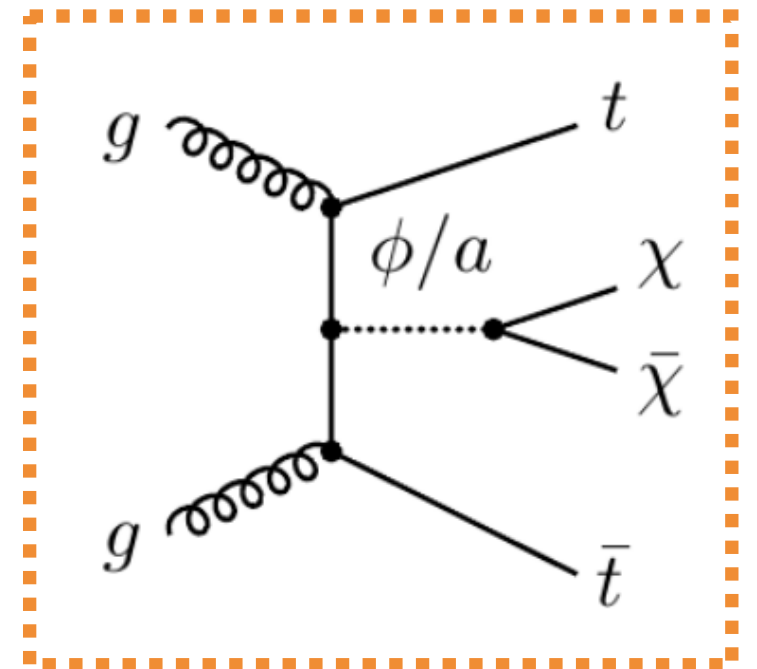
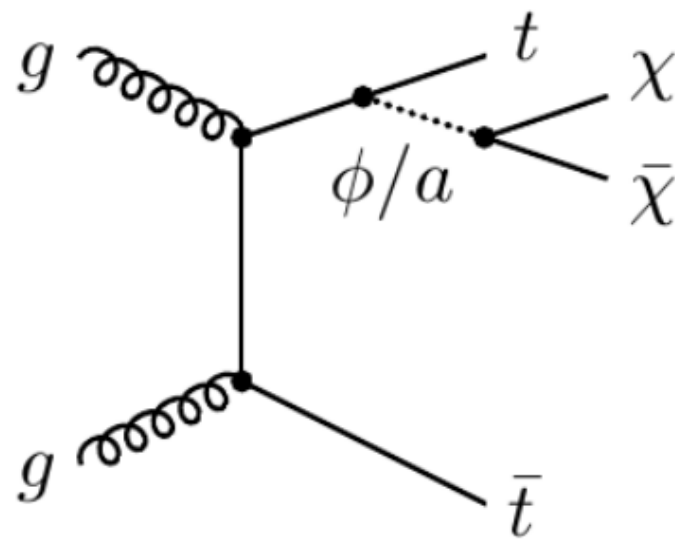
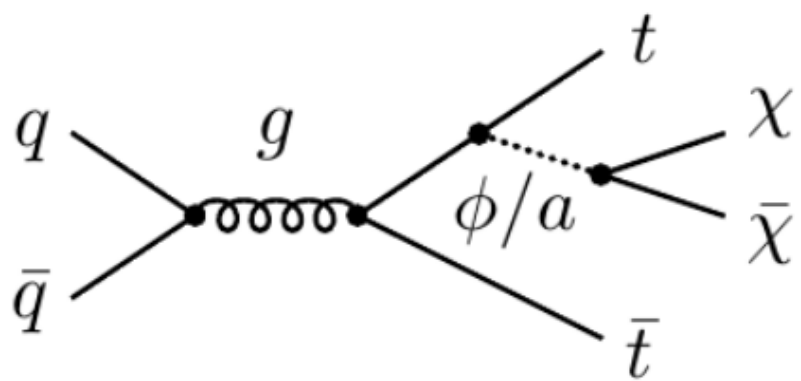
- Searching for dark matter production at the LHC.
 - Top quark pair production with missing transverse energy.



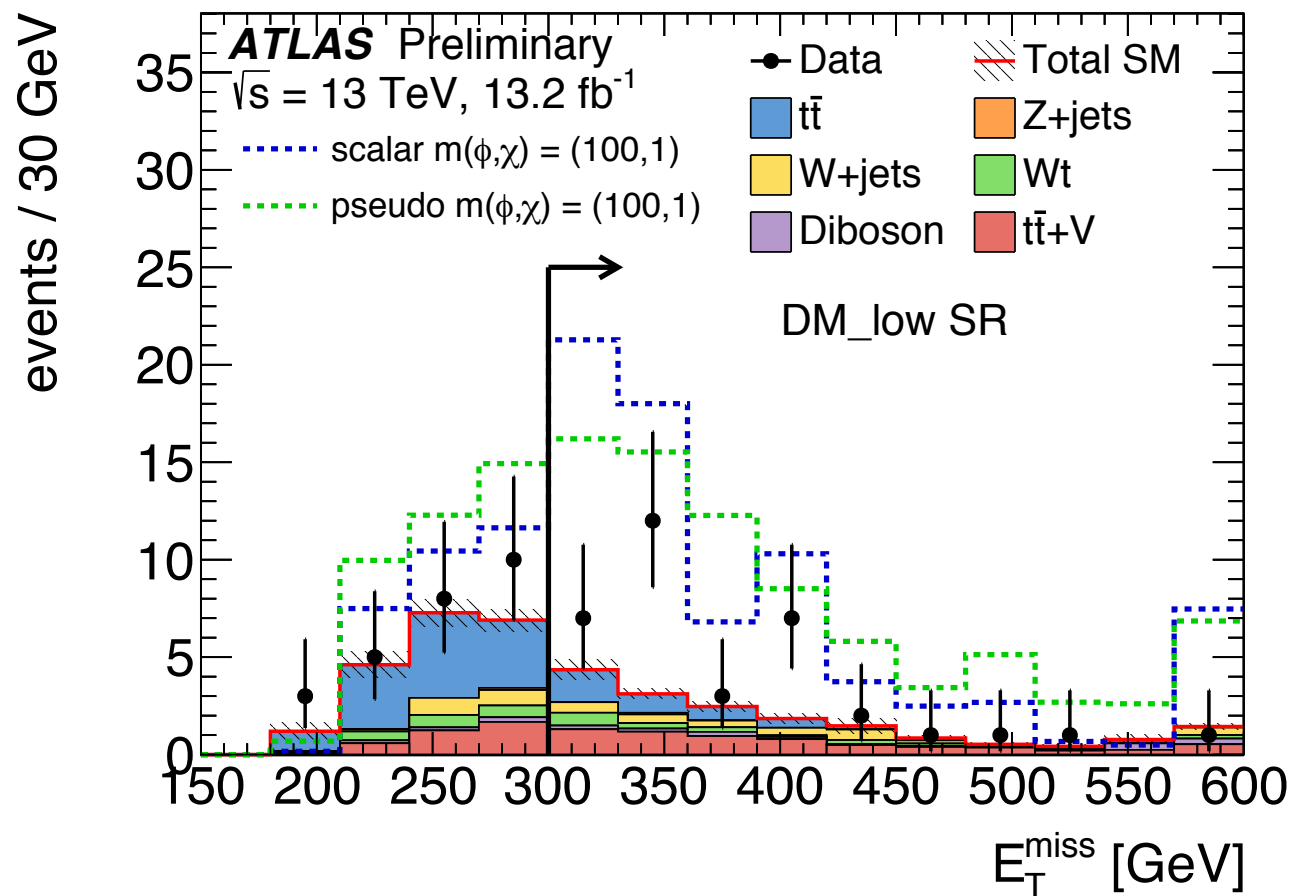
- ATLAS inner tracker (ITk) detector upgrade.
 - Work towards new silicon strip tracking detector.



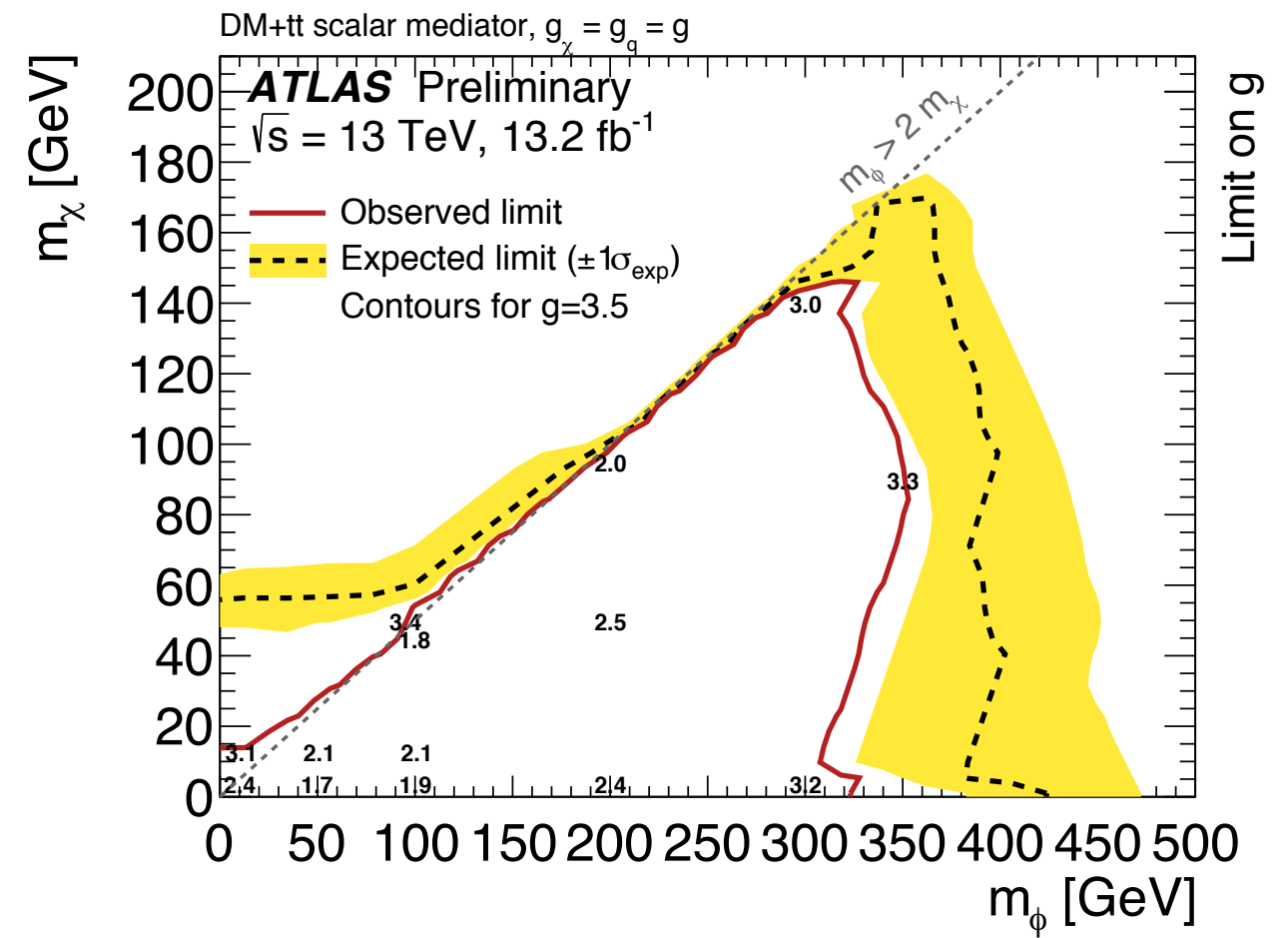
- Dark matter (DM) searches at the LHC compliment direct detection experiments.
- Simplified models:
 - DM interpreted as weakly interacting massive particle(s) that interact with SM via a mediator.
- For a scalar mediator coupling proportional to Yukawa term ($m_t = 172 \text{ GeV}$).



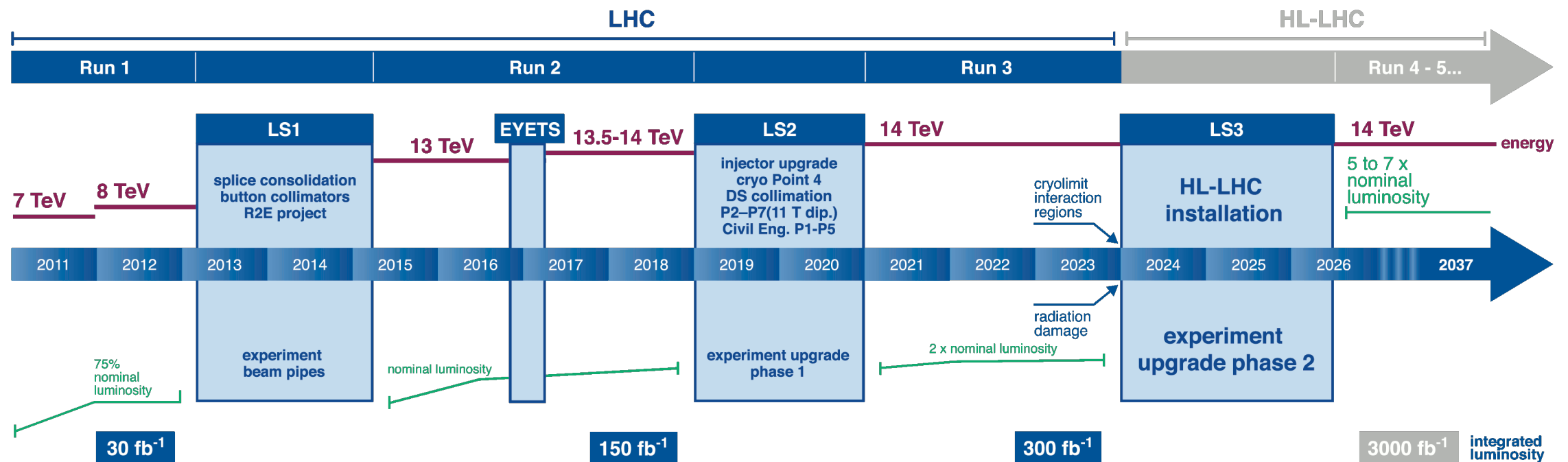
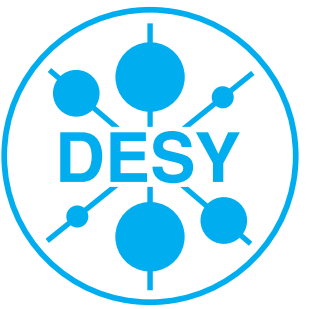
- $t\bar{t}+Z(\rightarrow\nu\nu)$ irreducible background in analysis, dominant in certain signal regions.
- Constrain normalisation using $t\bar{t}+Z(\rightarrow\ell\ell)$ and $t\bar{t}+\gamma$ events.
- Lepton triggers: allow to probe lower mediator masses.
- Shape fit to E_T^{miss} distributions.
- Paper planned for spring 2017.



ATLAS-CONF-2016-050



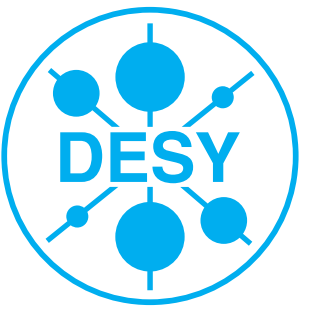
ATLAS-CONF-2016-050



- New ATLAS inner tracker (ITk) to be installed during LS3.
- Working in the silicon strip detector group.
- Process of R&D, assembly, quality control & assurance.

- Analysed testbeam data of silicon strip modules.
 - Contributed to ATLAS ITk TDR.
- Working on setup of ALiBaVa readout in testbeam.
 - ALiBaVa: an analogue measurement of front-end pulse shape and collected charge.
- Radiation length (X_0) measurements.





- PhD work:
 - Measurements of fiducial and differential cross sections for Higgs boson production.
 - *In-situ* calibration of the forward jet energy scale using dijet events.
- New projects at DESY:
 - Search for dark matter using top quark pairs.
 - Testbeam and other activities for ITk strips upgrade.