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Welcome to the PDF4LHC web page for collecting information on PDF relevant processes at the LHC

- See also: Public PDF4LHC webpage [↗](#) for general PDF4LHC information (Hosted at UCL)

The motivation for this PDF4LHC TWiki is to collect relevant information on available and future measurements for PDF studies, as well as the theoretical developments that are most pressing to make the most of LHC data. The plan, as briefly presented at the PDF4LHC meeting on December 13th is given on PDF4LHC charge [↗](#) and will be used as the basis of a public document that will summarise the status of PDF studies at the LHC. Right now we should collect the data.

The main charge is aiming at laying out a possible plan for key measurements to be done in the future, in order to reduce PDF systematics with LHC data, using present experience. In the last weeks it became also important that important to think on the precise measurements on the boundaries of the LHC kinematic phase space to help reducing the extrapolations needed for PDFs for eg FCC studies in the next years, so suggestions tailored to this question are also welcome.

People should feel free to add information to this web page following the format given below. The plan is to spend the next PDF4LHC meeting end of March on an in depth discussion and organise eventual additional studies abd the editing of the document.

This Twiki is divided into three main sections: LHC data for PDF studies, theoretical calculations and tools, and methodological issues in PDF fits.

LHC data for PDF studies

LHC data from Run I - Public results		
<i>Process</i>	<i>Data</i>	<i>Theory</i>
Inclusive W, Z production	ATLAS 2010 data arXv:1109.5141 ↗	Differential predictions at NNLO QCD
	WZinclusiveData	WZinclusiveTheory
Inclusive W,Z production	LHCb 7 TeV 37pb-1 (mu) arXv:1204.1620 ↗	
Inclusive Z production	LHCb 7 TeV 940pb-1 (e) arXv:1212.4620 ↗	
Inclusive W/Z production	CMS 8 TeV 19pb-1 (e/mu) arXiv:1402.0923 ↗	Inclusive cross section at NNLO
	CMS 7 TeV 36pb-1 (e/mu) arXiv:1107.4789 ↗	
W lepton charge asymmetry	CMS 7 TeV 840pb-1 (e) arXiv:1206.2598 ↗	
W lepton charge asymmetry	CMS 7 TeV 5fb-1 (mu) arXiv:1312.6283 ↗	
Top quark pair production	ATLAS 7 TeV 5fb-1 ATL-PHYS-PUB-2013-056	
Top quark pair production	ATLAS 7 TeV and 8 TeV data	Inclusive cross-sections at NNLO
	CMS 7 and 8 TeV data	Differential distributions at NLO+NNLL, full NNLO in progress
	TTbarData	TTbarTheory
Isolated photon production	ATLAS 7 TeV data from 2011 run arXiv:1311.1440 ↗	Differential distributions at NLO
	DirectPhotonData	DirectPhotonTheory
Isolated photon production	CMS 7 TeV 36pb-1 arXiv:1108.2044 ↗	
Isolated photon + jet	CMS 7 TeV 2.1fb-1 arXiv:1311.6141 ↗	

W production in association with charm	ATLAS 2011 data arXv:1402.6263 ↗	
W production in association with charm	CMS 7 TeV 5fb-1 arXiv:1310.1138 ↗	
Z production in association with charm	LHCb 7 TeV 1fb-1 arXv:1401.3245 ↗	
Z rapidity and transverse momentum	CMS 7 TeV 36pb-1 arXiv:1110.4973 ↗	
Z transverse momentum	ATLAS 7 TeV 4fb-1 arXiv:1211.6899 ↗	
Inclusive jet production	ATLAS 2011 2.76 data arXv:1304.4739 ↗	
Dijet production	ATLAS 2011 data arXv:1312.3524 ↗	
Inclusive jet and dijet production	CMS 7 TeV 5fb-1 arXiv:1212.6660 ↗	
3/2 jets ratio	CMS 7 TeV 5fb-1 arXiv:1304.7498 ↗	
Z + jets	LHCb 7 TeV 1fb-1 arXv:1310.8197 ↗	
Z + jets	ATLAS 7 TeV 4fb-1 arXv:1304.7098 ↗	
Single top production		
Low-mass Drell-Yan	ATLAS 2011 and 2010 data arXv:1404.1212 ↗	
High-mass Drell-Yan	ATLAS 2011 data arXiv:1305.4192 ↗	
Drell-Yan	CMS 7 TeV 5fb-1 arXiv:1310.7291 ↗	
Exclusive J/psi	LHCb 7 TeV 1fb-1 arXv:1401.3288 ↗	

LHC data from Run I - Results not yet available (preliminary only)		
<i>Process</i>	<i>Data</i>	<i>Theory</i>
Inclusive W, Z production	ATLAS 2011 and 2012 data	Differential predictions at NNLO QCD
	WZinclusiveData	WZinclusiveTheory
Z high-pT and Y	CMS 8 TeV 20fb-1: SMP-13-013	
Inclusive jets	CMS 8 TeV 20fb-1: SMP-12-012	
3-jets mass	CMS 7 TeV 5fb-1: SMP-12-027	

The inclusive production of W and Z boson is directly sensitive to the quark/antiquark flavor separation. The measurement of the rapidity distributions of the final state leptons provides a handle on quarks and antiquarks in a broad range of x. Data for this process is available from ATLAS, CMS and LHCb

Direct photon production at the LHC probes the gluon PDF via the QCD Compton Scattering

Theoretical Calculations

Fully differential predictions for W and Z production at hadron colliders are available in NNLO QCD in tools like FEWZ [↗](#) and DYNNLO [↗](#)

Inclusive Jets, Di-jets, Tri-jets

Fully differential predictions at hadron colliders are available only in NLO QCD NLO predictions can be interfaced to APPLgrid either via MCFM or to FastNLO via NLOJJet++

The NNLO calculation of inclusive top quark pair production cross-sections was presented in arXiv:1303.6254. This calculation was used to study the constraints on $g(x,Q)$ from the most updated top quark pair cross-section data from ATLAS and CMS in arXiv:1303.7215.

For isolated photon production the theory is available at NLO in QCD. For the direct component (not the fragmentation) NLO predictions can be interfaced to APPLgrid either via MCFM or aMCatNLO.

The constraints on the gluon PDF from LHC direct photon data were quantified in arXiv:1202.1762. Since this publication however many new data have become public. Also one needs to study the impact of theoretical uncertainties.

Methodological issues in PDF studies

PDF4LHC Web Utilities

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