

Multiboson Cross Section Measurements

Status: March 2015

$\int \mathcal{L} dt$
[fb⁻¹]

Reference

$\sigma^{\text{fid}}(\gamma\gamma)[\Delta R_{\gamma\gamma} > 0.4]$

$\sigma = 44.0^{+3.2}_{-4.2} \text{ pb (data)}$
 $2\gamma\text{NNLO (theory)}$

ATLAS Preliminary

4.9

JHEP 01, 086 (2013)

$\sigma^{\text{fid}}(W\gamma \rightarrow \ell\nu\gamma)$

$\sigma = 2.77 \pm 0.03 \pm 0.36 \text{ pb (data)}$
NNLO (theory)

4.6

PRD 87, 112003 (2013)
arXiv:1407.1618 [hep-ph]

– $[n_{\text{jet}} = 0]$

$\sigma = 1.76 \pm 0.03 \pm 0.22 \text{ pb (data)}$
NNLO (theory)

4.6

PRD 87, 112003 (2013)

$\sigma^{\text{fid}}(Z\gamma \rightarrow \ell\ell\gamma)$

$\sigma = 1.31 \pm 0.02 \pm 0.12 \text{ pb (data)}$
NNLO (theory)

4.6

PRD 87, 112003 (2013)
arXiv:1407.1618 [hep-ph]

– $[n_{\text{jet}} = 0]$

$\sigma = 1.05 \pm 0.02 \pm 0.11 \text{ pb (data)}$
NNLO (theory)

4.6

PRD 87, 112003 (2013)

$\sigma^{\text{fid}}(W\gamma\gamma \rightarrow \ell\nu\gamma\gamma)$

$\sigma = 6.1^{+1.1}_{-1.0} \pm 1.2 \text{ fb (data)}$
MCFM NLO (theory)

20.3

arXiv:1503.03243 [hep-ex]

– $[n_{\text{jet}} = 0]$

$\sigma = 2.9^{+0.8}_{-0.7} \pm 1.0 \pm 0.9 \text{ fb (data)}$
MCFM NLO (theory)

20.3

arXiv:1503.03243 [hep-ex]

$\sigma^{\text{fid}}(\text{pp} \rightarrow W\bar{V} \rightarrow \ell\nu q\bar{q})$

$\sigma = 1.37 \pm 0.14 \pm 0.37 \text{ pb (data)}$
MC@NLO (theory)

4.6

JHEP 01, 049 (2015)

$\sigma^{\text{fid}}(W^\pm W^\pm jj) \text{ EWK}$

$\sigma = 1.3 \pm 0.4 \pm 0.2 \text{ fb (data)}$
PowhegBox (theory)

20.3

PRL 113, 141803 (2014)

$\sigma^{\text{total}}(\text{pp} \rightarrow WW)$

$\sigma = 51.9 \pm 2.0 \pm 4.4 \text{ pb (data)}$
MCFM (theory)

4.6

PRD 87, 112001 (2013)

– $\sigma^{\text{fid}}(WW \rightarrow ee) [n_{\text{jet}}=0]$

$\sigma = 71.4 \pm 1.2 \pm 5.5 \pm 4.9 \text{ pb (data)}$
MCFM (theory)

20.3

ATLAS-CONF-2014-033

– $\sigma^{\text{fid}}(WW \rightarrow \mu\mu) [n_{\text{jet}}=0]$

$\sigma = 56.4 \pm 6.8 \pm 10.0 \text{ fb (data)}$
MCFM (theory)

4.6

PRD 87, 112001 (2013)

– $\sigma^{\text{fid}}(WW \rightarrow e\mu) [n_{\text{jet}}=0]$

$\sigma = 73.9 \pm 5.9 \pm 7.5 \text{ fb (data)}$
MCFM (theory)

4.6

PRD 87, 112001 (2013)

– $\sigma^{\text{fid}}(WW \rightarrow e\mu) [n_{\text{jet}} \geq 0]$

$\sigma = 262.3 \pm 12.3 \pm 23.1 \text{ fb (data)}$
MCFM (theory)

4.6

PRD 87, 112001 (2013)

$\sigma^{\text{total}}(\text{pp} \rightarrow WZ)$

$\sigma = 19.0 \pm 1.4 \pm 1.3 \pm 1.0 \text{ pb (data)}$
MCFM (theory)

4.6

EPJC 72, 2173 (2012)

– $\sigma^{\text{fid}}(WZ \rightarrow \ell\nu\ell\ell)$

$\sigma = 20.3 \pm 0.8 \pm 0.7 \pm 1.4 \pm 1.3 \text{ pb (data)}$
MCFM (theory)

13.0

ATLAS-CONF-2013-021

$\sigma^{\text{total}}(\text{pp} \rightarrow ZZ)$

$\sigma = 99.2 \pm 3.8 \pm 3.0 \pm 6.0 \pm 6.2 \text{ fb (data)}$
MCFM (theory)

13.0

ATLAS-CONF-2013-021

– $\sigma^{\text{total}}(\text{pp} \rightarrow ZZ \rightarrow 4\ell)$

$\sigma = 6.7 \pm 0.7 \pm 0.5 \pm 0.4 \text{ pb (data)}$
MCFM (theory)

4.6

JHEP 03, 128 (2013)

– $\sigma^{\text{fid}}(ZZ \rightarrow 4\ell)$

$\sigma = 7.1 \pm 0.5 \pm 0.4 \pm 0.4 \text{ pb (data)}$
MCFM (theory)

20.3

ATLAS-CONF-2013-020

– $\sigma^{\text{fid}}(ZZ^* \rightarrow 4\ell)$

$\sigma = 76.0 \pm 18.0 \pm 4.0 \text{ fb (data)}$
Powheg (theory)

4.5

arXiv:1403.5657 [hep-ex]

– $\sigma^{\text{fid}}(ZZ^* \rightarrow \ell\ell\nu\nu)$

$\sigma = 107.0 \pm 9.0 \pm 5.0 \text{ fb (data)}$
Powheg (theory)

20.3

arXiv:1403.5657 [hep-ex]

$\sigma = 25.4 \pm 3.3 \pm 3.0 \pm 1.6 \pm 1.4 \text{ fb (data)}$
PowhegBox & gg2ZZ (theory)

4.6

JHEP 03, 128 (2013)

$\sigma = 20.7 \pm 1.3 \pm 1.2 \pm 1.0 \text{ fb (data)}$
MCFM (theory)

20.3

ATLAS-CONF-2013-020

$\sigma = 29.8 \pm 3.8 \pm 3.5 \pm 2.1 \pm 1.9 \text{ fb (data)}$
PowhegBox & gg2ZZ (theory)

4.6

JHEP 03, 128 (2013)

$\sigma = 12.7 \pm 3.1 \pm 2.9 \pm 1.8 \text{ fb (data)}$
PowhegBox & gg2ZZ (theory)

4.6

JHEP 03, 128 (2013)

0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6

observed/theory

LHC pp $\sqrt{s} = 7 \text{ TeV}$



Theory

Observed

stat

stat+syst

LHC pp $\sqrt{s} = 8 \text{ TeV}$



Theory

Observed

stat

stat+syst