

Cross sections are computed for $m_H=125.09$ GeV by using the YR4 input parameters. More details can be found on the LHCHSWG-INT-2019-0xx note and in Sec. 2.2 of the HL-HE report.

Gluon fusion

- Cross sections are calculated at (approx.) NNNLO QCD and NLO EW accuracy using the program iHixs.

| \sqrt{s} (TeV) | | + (theory) | - (theory) | \pm (PDF) | + () | - () |
|------------------|-----------|------------|------------|-------------|-------|-------|
| 13 | 48.61 pb | 4.27% | 6.49% | 1.85% | 2.59% | 2.62% |
| 14 | 54.72 pb | 4.28% | 6.46% | 1.85% | 2.60% | 2.62% |
| 27 | 146.65 pb | 4.53% | 6.43% | 1.95% | 2.69% | 2.64% |

Vector boson fusion

- Cross sections are calculated at NNLO QCD with the program proVBFH while the EW and photon contributions have been computed at NLO with HAWK

| \sqrt{s} (TeV) | | + (scale) | - (scale) | Δ_{PDF+} | DIS | EWK | | σ_{sch} |
|------------------|----------|-----------|-----------|-----------------|----------|-------|---------|----------------|
| 13 | 3766 fb | 0.43% | 0.33% | $\pm 2.1\%$ | 3939 fb | -5.3% | 35.3 fb | 1412 fb |
| 14 | 4260 fb | 0.45% | 0.34% | $\pm 2.1\%$ | 4460 fb | -5.4% | 40.7 fb | 1555 fb |
| 27 | 11838 fb | 0.66% | 0.36% | $\pm 2.1\%$ | 12483 fb | -6.2% | 129 fb | 3495 fb |

VH production

Cross sections are calculated at NNLO QCD and NLO EW with the program HAWK

* WH production

| \sqrt{s} (TeV) | σ_{WH} | + (scale) | - (scale) | Δ_{PDF+} |
|------------------|---------------|-----------|-----------|-----------------|
| 13 | 1.358 pb | 0.51% | 0.51% | $\pm 1.35\%$ |
| 14 | 1.498 pb | 0.51% | 0.51% | $\pm 1.35\%$ |
| 27 | 3.397 pb | 0.29% | 0.72% | $\pm 1.37\%$ |

* W+H production

| \sqrt{s} (TeV) | σ_{W+H} | + (scale) | - (scale) | Δ_{PDF+} |
|------------------|----------------|-----------|-----------|-----------------|
| 13 | 0.831 pb | 0.74% | 0.73% | $\pm 1.79\%$ |
| 14 | 0.913 pb | 0.64% | 0.76% | $\pm 1.78\%$ |
| 27 | 1.995 pb | 0.43% | 1.04% | $\pm 1.84\%$ |

* W-H production

| \sqrt{s} (TeV) | σ_{W-H} | + (scale) | - (scale) | Δ_{PDF+} |
|------------------|----------------|-----------|-----------|-----------------|
| 13 | 0.527 pb | 0.59% | 0.63% | $\pm 2.03\%$ |
| 14 | 0.585 pb | 0.55% | 0.68% | $\pm 1.98\%$ |
| 27 | 1.402 pb | 0.36% | 0.93% | $\pm 2.03\%$ |

* I+ H production

| \sqrt{s} (TeV) | | + (scale) | - (scale) | Δ_{PDF+} | |
|------------------|----------|-----------|-----------|-----------------|---------------------|
| 13 | 0.094 pb | 0.71% | 0.70% | $\pm 1.72\%$ | $4.1 \cdot 10^{-3}$ |
| 14 | 0.104 pb | 0.61% | 0.73% | $\pm 1.70\%$ | $4.7 \cdot 10^{-3}$ |
| 27 | 0.232 pb | 0.40% | 0.97% | $\pm 1.72\%$ | $1.5 \cdot 10^{-2}$ |

* Γ H production

| \sqrt{s} (TeV) | | + (scale) | - (scale) | $\Delta_{\text{PDF}+\sqrt{s}}$ | |
|------------------|-----------|-----------|-----------|--------------------------------|---------------------|
| 13 | 0.0598 pb | 0.57% | 0.60% | $\pm 1.94\%$ | $2.6 \cdot 10^{-3}$ |
| 14 | 0.0666 pb | 0.52% | 0.64% | $\pm 1.89\%$ | $3.1 \cdot 10^{-3}$ |
| 27 | 0.1628 pb | 0.34% | 0.87% | $\pm 1.90\%$ | $1.1 \cdot 10^{-2}$ |

* ZH production

| \sqrt{s} (TeV) | | + (scale) | - (scale) | $\Delta_{\text{PDF}+\sqrt{s}}$ |
|------------------|----------|-----------|-----------|--------------------------------|
| 13 | 0.880 pb | 3.50% | 2.64% | $\pm 1.65\%$ |
| 14 | 0.981 pb | 3.61% | 2.94% | $\pm 1.90\%$ |
| 27 | 2.463 pb | 5.42% | 4.00% | $\pm 2.24\%$ |

* ZH production (without loop induced contribution)

| \sqrt{s} (TeV) | | + (scale) | - (scale) | $\Delta_{\text{PDF}+\sqrt{s}}$ |
|------------------|----------|-----------|-----------|--------------------------------|
| 13 | 0.758 pb | 0.49% | 0.61% | $\pm 1.78\%$ |
| 14 | 0.836 pb | 0.51% | 0.62% | $\pm 1.82\%$ |
| 27 | 1.937 pb | 0.56% | 0.74% | $\pm 2.37\%$ |

* ZH production (loop induced contribution)

| \sqrt{s} (TeV) | | + (scale) | - (scale) | $\Delta_{\text{PDF}+\sqrt{s}}$ |
|------------------|----------|-----------|-----------|--------------------------------|
| 13 | 0.123 pb | 24.9% | 18.8% | $\pm 4.37\%$ |
| 14 | 0.145 pb | 24.3% | 19.6% | $\pm 7.47\%$ |
| 27 | 0.526 pb | 25.3% | 18.5% | $\pm 5.85\%$ |

* Γ H H

| \sqrt{s} (TeV) | | + (scale) | - (scale) | $\Delta_{\text{PDF}+\sqrt{s}}$ | |
|------------------|-------------------------|-----------|-----------|--------------------------------|---------------------|
| 13 | $2.97 \cdot 10^{-2}$ pb | 3.49% | 2.67% | $\pm 1.64\%$ | $1.4 \cdot 10^{-4}$ |
| 14 | $3.31 \cdot 10^{-2}$ pb | 3.59% | 2.92% | $\pm 1.89\%$ | $1.6 \cdot 10^{-4}$ |
| 27 | $8.32 \cdot 10^{-2}$ pb | 5.39% | 3.97% | $\pm 1.85\%$ | $5.4 \cdot 10^{-4}$ |

* H production

| \sqrt{s} (TeV) | | + (scale) | - (scale) | $\Delta_{\text{PDF}+\sqrt{s}}$ |
|------------------|----------|-----------|-----------|--------------------------------|
| 13 | 0.177 pb | 3.50% | 2.68% | $\pm 1.65\%$ |
| 14 | 0.197 pb | 3.59% | 2.92% | $\pm 1.89\%$ |
| 27 | 0.496 pb | 5.41% | 3.99% | $\pm 2.24\%$ |

ttH and tH production

Cross sections for ttH are calculated at NLO QCD and NLO EW while for tH they are at NLO QCD

* ttH

| \sqrt{s} (TeV) | | + (scale) | - (scale) | $\Delta_{\sqrt{s}}$ | Δ_{PDF} | $\Delta_{\text{PDF}+\sqrt{s}}$ |
|------------------|----------|-----------|-----------|---------------------|-----------------------|--------------------------------|
| 14 | 612.8 fb | 6.0% | 9.2% | $\pm 1.9\%$ | $\pm 2.9\%$ | $\pm 3.5\%$ |
| 27 | 2.86 pb | 7.8% | 9.0% | $\pm 1.8\%$ | $\pm 2.1\%$ | $\pm 2.8\%$ |

* tH+ tH

| \sqrt{s} (TeV) | | + (scale) | - (scale) | $\Delta_{\sqrt{s}}$ | Δ_{PDF} | $\Delta_{\text{PDF}+\sqrt{s}}$ |
|------------------|----------|-----------|-----------|---------------------|-----------------------|--------------------------------|
| 14 | 90.12 fb | 6.4% | 14.7% | $\pm 1.2\%$ | $\pm 3.4\%$ | $\pm 3.6\%$ |
| 27 | 417.9 fb | 5.0% | 12.5% | $\pm 1.3\%$ | $\pm 2.6\%$ | $\pm 2.9\%$ |

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