

EW corrections to tri-boson / VBS

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EW corrections:

- Leading behaviour:
Sudakov logarithms, $\log^2 \left(\frac{Q^2}{M_W^2} \right)$
- For 13 TeV-LHC usually small at the level of total cross section
- Grow large in the high-energy limit (usually suppressed)

→ For HL-LHC:

Study precision of measurements including EW corrections

→ For HE-LHC:

Study of EW corrections at very high energy
(They are expected to become large)

EW corrections known for 13 TeV-LHC:

- $ZZ\gamma$ [Yong et al., 1707.03534]
- WWW [Yong-Bai et al., 1605.00554], [Dittmaier, Huss, Knippen; 1705.03722] (on-shell)
- WZZ [Yong-Bai et al., 1507.03693]
- ZZZ [Hong et al., 1610.05876]

→ At 13 TeV the corrections are about 4 – 5%

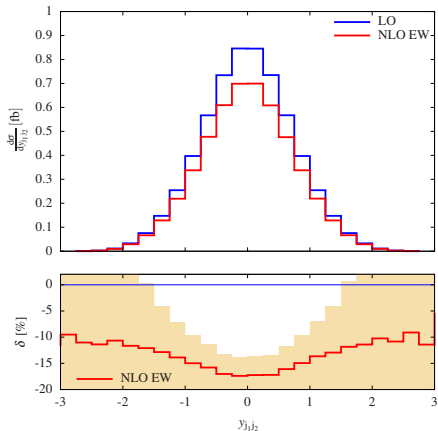
→ How well tri-boson can be measured at HL-LHC?

Are EW corrections of any relevance there?

→ How do EW corrections behave at higher energy (HE-LHC)?

→ Large EW corrections as a feature of VBS at the LHC

[Biedermann, Denner, MP; 1611.02951] - example of W^+W^+



Band: expected stat. exp. unc. for H-L LHC 3000fb^{-1} as $\pm 1/N_{\text{Obs}}$

- These corrections can probably be measured at the HL-LHC.
- Interesting to see if EW corr. explode at HE-LHC

- Time scale: Few months (depending on the objectives)
- Manpower: Denner+Me
- Possible projects (in order of feasibility/time scale):
 - EW corrections for VBS (W^+W^+) for HL-LHC.
Data and calculation already there.
Possibly to improve following experimental guidance.
 - EW corrections for VBS (W^+W^+) for HE-LHC.
Code is there, we “just” need to change centre-of-mass energy and event selection.
 - Tri-boson:
Reach of HL-LHC: can one measure tri-boson with few per cent accuracy? (experimental guidance welcome here)
Study at HE-LHC: kinematic, EW corrections.

→ Need to know envisaged event selection at HE-LHC
(for HL-LHC probably rather similar to now)

- Should we include in the real radiation massive-gauge bosons?
(these can lower EW corrections)
- Will these be different signatures as for the LHC?
example: $W^+W^+jj \neq W^+W^+Vjj$?
- Or inclusive measurement in extra leptons/jet?
For jets, probably yes?
Can very close leptons to tagging jets (for VBS) be resolved?

→ Question to be answered by the experimentalists (soon)