Status update VBS section

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Status

Experimental review

- First draft complete (22 pages)
- Summary of all currently available VBS measurements
- Dedicated comparisons of systematics tables

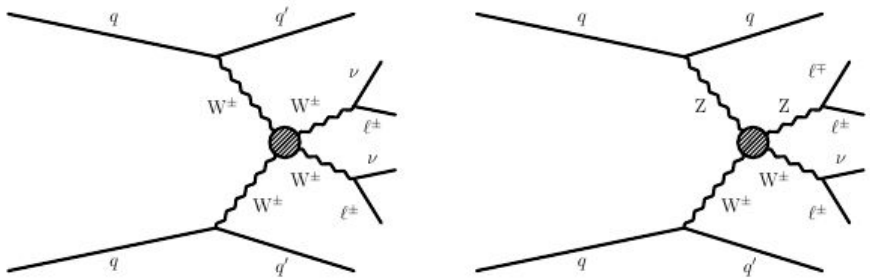
Theory review

- First draft complete (3 pages)

Experimental review

Covering the following channels:

- fully leptonic:
  - $\mathrm{W}^{\pm}\mathrm{W}^{\pm} \to \ell^{\pm}\nu\ell^{\pm}\nu$
  - $\mathrm{W}^{\pm}\mathrm{W}^{\mp} \to \ell^{\pm}\nu\ell^{\mp}\nu$
  - $W^{\pm}Z \to 3\ell\nu$
  - $ZZ \to 4\ell/2\ell 2\nu$
- semi-leptonic/hadronic:
  - $\mathrm{WW/WZ} \to \ell\nu jj$
  - $\mathrm{ZW}/ZZ \to \ell\ell\mathrm{jj}$
  - $ZZ/\mathrm{WW} \to \mathrm{jjjj}$
  - $ZZ/\mathrm{WZ} \to \mathrm{jj}\nu\nu$
- photonic:
  - $\mathrm{Z}\gamma \to \ell^{\pm}\ell^{\mp}\gamma/\nu\nu\gamma$
  - $\mathrm{W}\gamma \to \ell\nu\gamma$



General introduction into VBS

Given the relatively large backgrounds, multivariate (MVA) techniques are commonly used to better separate signal and backgrounds [24]. Different MVA implementations are pursued, e.g., Boosted Decision Trees (BDTs), Deep Neural Nets (DNNs), ans Artifitial Neural Nets (ANNs). The MVA output is usually used as final discriminant variable in the signal region (SR). There are typical three set of variables used as input in VBS analyses:

- related to dijet system (m_{jj}, $|\Delta\eta_{\mathrm{jj}}|$, $\Delta\phi_{\mathrm{jj}}$, $p_{\mathrm{T}}^{\mathrm{j1}}$, $p_{\mathrm{T}}^{\mathrm{j2}}$...);
- related to diboson system (p_{T}^{ℓ}, m_{VV}, $p_{\mathrm{T}}^{\mathrm{miss}}$...);
- related to jet-boson system ($\Delta R_{\mathrm{j1,Z}}$, $|\eta^{\ell} - \frac{\eta^{\mathrm{j_1}} + \eta^{\mathrm{j_2}}}{2}|/|\Delta\eta_{\mathrm{jj}}|$...).

Experimental review

– Short description of each measurement

– Comparison of systematics side by side
(converted into percent)

– Prospects for HL-LHC

– Had discussed to add a more explicit
Reference to another review paper (see also theory bit)

Source of uncertainty	ATLAS	CMS
Integrated luminosity	2.4	1.5
Lepton measurement	1.4	2.1
Jet energy scale and resolution	3.2	1.5
Pileup	1.6	0.1
B-jet tagging	2.1	1.0
Background rate	3.4	3.5
Limited sample size	3.2	2.6
Theory	5.5	1.9
Total systematic uncertainty	8.9	5.7
Statistical uncertainty	17	8.9
Total uncertainty	20	11

In this section, we quickly review the state of the art of Standard Model predictions for vector-boson scattering (VBS). In addition, we list few recommendations and good practice that might show useful for future LHC phases. We would to emphasis that the review of Ref. [62] contains much more information and the interested reader should rather refer to this work.

Theory review

Brief review of state of the art of:

- Higher-order corrections
- Polarised predictions
- Availability in public Monte Carlo

Theory review

Recommendations and good practice

- Present results for full process (QCD+int+EWK) as well as for separate contributions
- Be aware that VBS approximation (QCD correction in VBS) might not work well if measurements become more precise or for special phase space
- Use phase space that makes sense beyond LO (e.g. keep in mind real radiation that might not be included in your LO MC but in data)
- Use state-of-the-art predictions
- Use proper VBS settings for PS (upon using right settings, central jet vetoes are safe)
- Be very explicit about all cuts (esp. delta R (l,j), (l,l) …)

Thank you!

First drafts are available

Some polishing still needs to be done

General content is there