

Proposed VBS Fiducial Definitions

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- ▶ Aim of this brief talk is to summarize proposed common VBS fiducial selections at generator-level
- ▶ These are just suggestions:
 - ▶ define looser generator-level selections w.r.t. reconstructed-level selections
 - ▶ easier to extrapolate from reconstructed-level to generator-level
- ▶ Roughly emulating existing analyses
 - ▶ actual reconstructed-level analysis will be fine-tuned considering the different experimental aspects
- ▶ Could think about inclusive $VVjj$ production and electroweak $VVjj$ production
 - ▶ tigher dijet selection in the second case

- ▶ Charged leptons $\equiv \mu, e \equiv$ dressed-leptons
 - ▶ Summing-up photons around within $\Delta R(\ell, \gamma) < 0.1$
- ▶ $\Delta R(x_1, x_2) = \sqrt{(\Delta\eta_{x_1x_2})^2 + (\Delta\phi_{x_1x_2})^2}$
- ▶ Missing transverse momentum $\equiv p_T^{\text{miss}}$
- ▶ $m_T^W = \sqrt{2p_T^{\text{miss}} p_T^\ell (1 - \cos(\Delta\phi_{\vec{p}_T^{\text{miss}}\ell}))}$
- ▶ Jets: clustering stable and visible particles using the anti- k_T algorithm with a distance parameter of 0.4

Proposal

"Tight" electroweak region selection		
Final state	Object	Selection requirements
All	Charged leptons	$ \eta < 2.5$
	Photons	$p_T > 20$ GeV, $ \eta < 2.4$, $\Delta R(\gamma, \ell) > 0.4$
	Jets	$p_T > 30$ GeV, $ \eta < 5.0$, $\Delta R(j, \ell) > 0.4$, $\Delta R(j, \gamma) > 0.4$
	Dijet	$m_{jj} > 500$ GeV, $ \Delta\eta_{jj} > 2.5$
	Fit region	$m_{jj} : [500, 800, 1200, 1600, 2000, \infty]$ GeV
Fully leptonic final states		
$W^\pm W^\pm$ $W^\pm W^\mp$	Charged leptons	$p_T^{1,2} > 20$ GeV
	Kinematic	$p_T^{\text{miss}} > 20$ GeV, $m_{\ell\ell} > 20$ GeV
$W^\pm Z$	Charged leptons	$p_T^{z1, z2, w} > 20/10/20$ GeV
	Kinematic	$p_T^{\text{miss}} > 20$ GeV, $m_{3\ell} > 100$ GeV, $ m_{\ell\ell} - m_Z < 15$ GeV
ZZ	Charged leptons	$p_T^{1,2,3,4} > 20/10/5/5$ GeV
	Kinematic	$m_{\ell+\ell-} > 4$ GeV, $m_{4\ell} > 180$ GeV, $ m_{\ell\ell} - m_Z < 15$ GeV
Leptonic and photonic final states		
$Z\gamma$	Charged leptons	$p_T^{1,2} > 20$ GeV
	Kinematic	$ m_{\ell\ell} - m_Z < 15$ GeV
$W^\pm\gamma$	Charged leptons	$p_T^1 > 30$ GeV
	Kinematic	$p_T^{\text{miss}} > 30$ GeV, $m_T^W > 30$ GeV
"Looser" VVjj region selection		
All	Dijet	$m_{jj} > 300$ GeV, $ \Delta\eta_{jj} > 1.5$
	Fit region	$m_{jj} : [300, 400, 500, 800, 1200, 1600, 2000, \infty]$ GeV

- ▶ A Rivet plugin could easily be built with this proposal
- ▶ A QCD-enriched region with $m_{jj} < 300$ GeV could be a bit dangerous due to the triboson contributions, see e.g.,

▶ [Arxiv:1803.07943](https://arxiv.org/abs/1803.07943) and [Arxiv:2009.00411](https://arxiv.org/abs/2009.00411)