VV→llqq - Comparison MC/DATA

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VZ llqq/vvqq bi-weekly meeting xx,xx,yyyy

$V_l V_h$ analysis

Signal Regions

W(1l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)

Z(2l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)

Z(0l) W(h) -> 2VBF + 2ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP, M_LP)

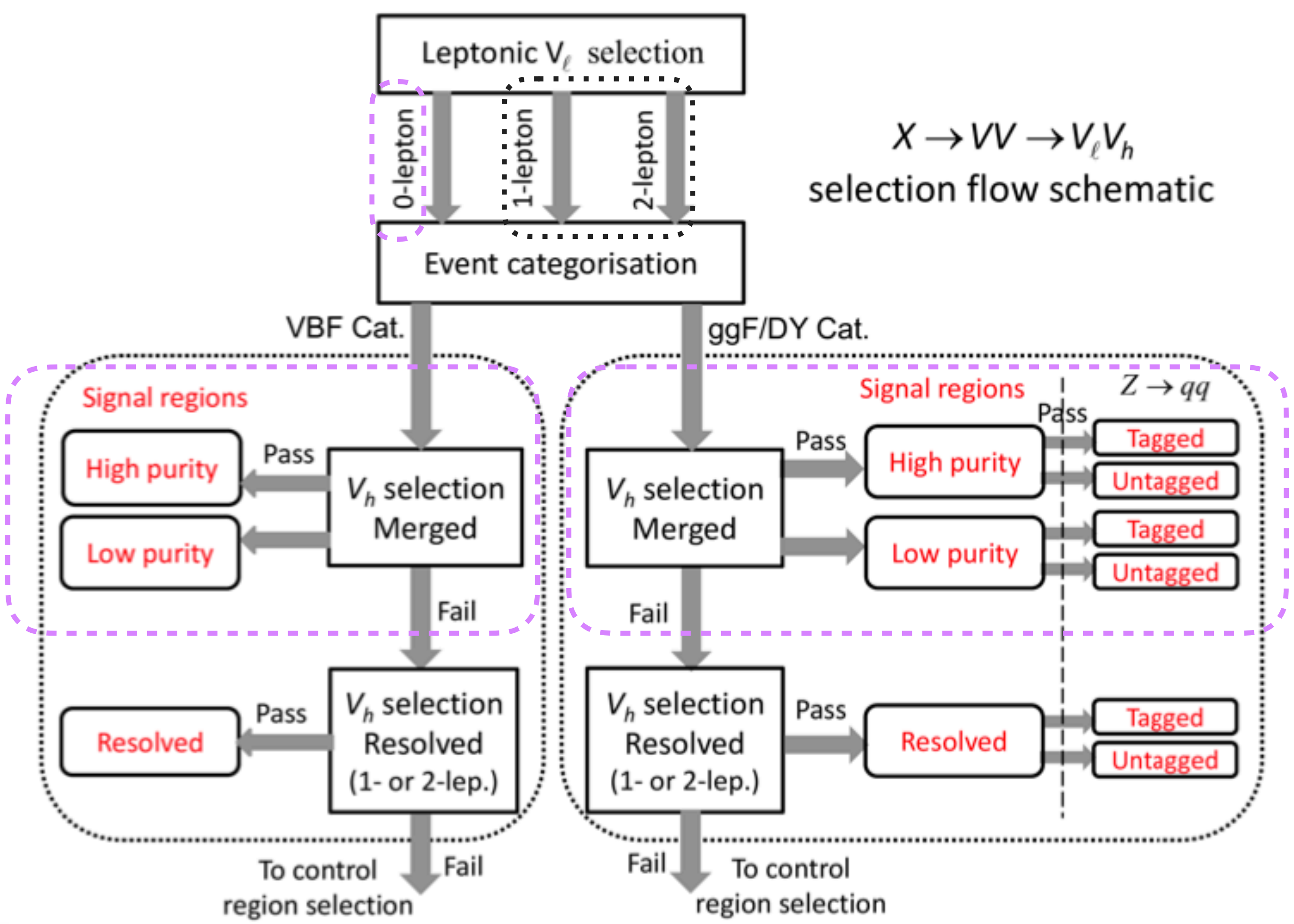
W(1l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag)

Z(2l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag)

Z(0l) Z(h) -> 2VBF + 4ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP_1tag, M_LP_1tag, M_HP_0tag, M_LP_0tag)

Per process	
WW -> 6 SR	
ZZ -> 15 SR	
ZW (any order) -> 19 SR	

Per leptonic channel	
2L -> 15 SR	
1L -> 15 SR	
0L -> 10 SR	



$X \to VV \to V_\ell V_h$ selection flow schematic

ZV2Lep analysis

Merged Selection		SR HP	SR LP	Z CR HP	Z CR LP	
$Z \to ll$	# loose leptons, p_T^l >30 GeV	2				>2 Veto, event rejected
	Opposite charge μ no requirement on electron charge					
	Z mass window cut	$p_T(ll)$ dependent for μμ, [83,99] MeV for ee				
$W/Z \to J$	# large-R jets	≥ 1				
	D_2 cut ← p_T dependent	Pass	Fail	Pass	Fail	Leading large-R jet
	WZ mass window cut	Pass		Fail		
	# of associated VR track jets b-tagged	For $Z \to J$: $\leq 1(=2)$ or untagged (tagged) category				>2 or >0 unrelated, event rejected
Topology cut	$\min(p_{T,ll}, p_{T,J}) m_{WV}$	>0.35(0.25) for DY/ggF (VBF) category				
Top-quark veto	# of b-taggd jets outside of large R-jet	0				
Pass VBF selection		No (yes) for DY/ggF (VBF) category				

Resolved Selection		SR	Z CR	
$Z \to ll$	# loose leptons, p_T^l >30 GeV	2 (OS if μμ)		>2 Veto, event rejected
	Z mass window cut	$p_T(ll)$ dependent for μμ, [83,99] MeV for ee		
$W/Z \to jj$	# small-R jets	≥ 2 in $\lvert\eta\rvert<2.5$		
	Leading jet p_T	>60 GeV		
	Sub-leading jet p_T	~~>45 GeV~~ >30 GeV (2L case)		
	$Z \to q\bar{q}$	$70 < m_{jj} < 105$ GeV	$50 < m_{jj} < 62$ GeV or	Two leading or 2 b-tagged
	$W \to q\bar{q}$	$62 < m_{jj} < 97$ GeV	$105 < m_{jj} < 150$ GeV	
	# of b-tagged jets	For $Z \to jj$: $\leq 1(=2)$ or untagged (tagged) category		>2, event rejected
Topology cuts	$\Delta\phi(j,l)$	>1.0		
	$\Delta\phi(j, E^T_{miss})$	>1.0		
	$\Delta\phi(j,j)$	>1.5		
	$\Delta\phi(l, E^T_{miss})$	>1.5		
	$\min(p_{T,ll}, p_{T,jj}) m_{WV}$	>0.35 for DY/ggF (VBF) category		
Top-quark veto	# of additional b-tagged jets	0		
Pass VBF selection		No (yes) for DY/ggF (VBF) category		

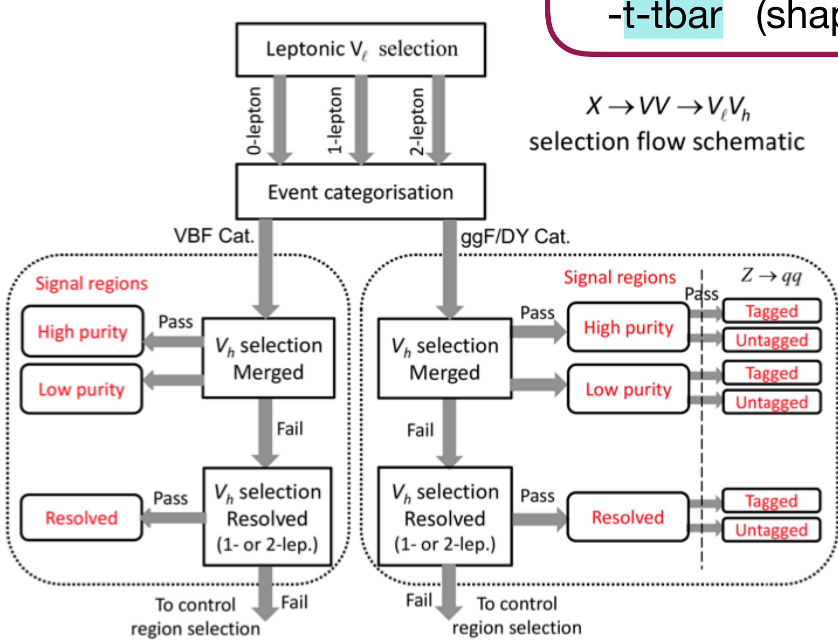
$V_l V_h$ analysis

Background processes

W(1l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)
Z(2l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)
Z(0l) W(h) -> 2VBF + 2ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP, M_LP)

W(1l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag)
Z(2l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag)
Z(0l) Z(h) -> 2VBF + 4ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP_1tag, M_LP_1tag, M_HP_0tag, M_LP_0tag)

Background processes:		Main SRs affected: *most affected on the left*
-multi-jet	(fully data driven)	1L (resolved, untag), …
-di-boson	(from MC)	all
-single-top	(from MC)	1L, …
-W+jets	(shape from MC, norm. from CR)	1L (untag), 2L …
-Z+jets	(shape from MC, norm. from CR)	2L, 0L (Z->vv), 1L
-t-tbar	(shape from MC, norm. from CR)	1L (tag), 2L, 0L



$X \to VV \to V_\ell V_h$ selection flow schematic

	Main backgrounds by channel *most abundant on the left*
0L untag	Z(vv)+jets, W+jets
1L untag	W+jets, t-tbar
2L untag	Z(ll)+jets
0L tag	Z(vv)+jets, t-tbar, W+jets
1L tag	t-tbar, W+jets
2L tag	Z(ll)+jets, t-tbar

$V_l V_h$ analysis

Control Regions

W(1l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res) rev. cut rev. cut
Z(2l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)
Z(0l) W(h) -> 2VBF + 2ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP, M_LP)

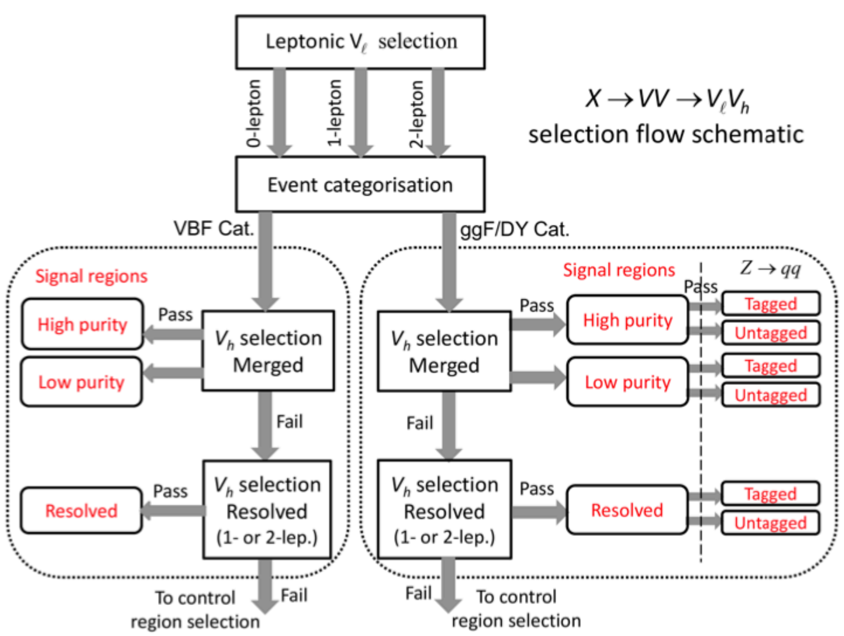
W(1l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag) rev. cut rev. cut
Z(2l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag) rev. cut
Z(0l) Z(h) -> 2VBF + 4ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP_1tag, M_LP_1tag, M_HP_0tag, M_LP_0tag)

2L -> 15 SR and 15 Z-CR
1L -> 15 SR and 15 W-CR and 15 ttbar-CR
0L -> 10 SR

Overall 45 CRs

-> 15 scale factors* for Z+jet MC in each corresponding SR (**) and in 15 CRs
-> 15 scale factors* for W+jet MC in each corresponding SR (**) and in 15 CRs
-> 15 scale factors* for t-tbar MC in each corresponding SR (**) and in 15 CRs

* free in the fit, both for the background only hypothesis, and the Signal hypo
** of 0L, 1L and 2L, i.e. all 40 SR



Main backgrounds by channel
most abundant on the left

1L	W+jets, t-tbar	WCR	reverting m(J) or m(jj) cut
2L	Z(ll)+jets	ZCR	reverting m(J) or m(jj) cut
1L	t-tbar, W+jets	t-tbar CR	reverting (1) extra b-jet veto reverting (1) extra b-jet veto, wider m(jj)

$V_l V_h$ analysis

Signal & Control Regions in the fits

W(1l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)
Z(2l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)
Z(0l) W(h) -> 2VBF + 2ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP, M_LP)

W(1l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag)
Z(2l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag)
Z(0l) Z(h) -> 2VBF + 4ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP_1tag, M_LP_1tag, M_HP_0tag, M_LP_0tag)

2L -> 15 SR and 15 Z-CR
1L -> 15 SR and 15 W-CR and 15 ttbar-CR
0L -> 10 SR

Overall 40 SRs

Overall 45 CRs

-> 15 scale factors* for Z+jet MC in each corresponding SR (**) and in 15 CRs
-> 15 scale factors* for W+jet MC in each corresponding SR (**) and in 15 CRs
-> 15 scale factors* for t-tbar MC in each corresponding SR (**) and in 15 CRs

* free in the fit, both for the background only hypothesis, and the Signal hypo
** of 0L, 1L and 2L, i.e. all 40 SR

ZZ+WW fit

WW -> 6 SR +2x6 CRs
\+
ZZ -> 15 SR +9 CRs

21 SRs + 21 CRs

1 fit for Background-only hypo OR ***Radion, Graviton -> WW, ZZ OR Z'(HVT)->WW***

WZ fit

ZW+WZ -> 19 SR +6 CRs +2x9 CRs

1 fit for Background-only hypo OR ***W'(HVT)->WZ***

19 SRs + 24 CRs

2L -> 15 SR
1L -> 15 SR
0L -> 10 SR

VBF and ggF/DY are fit independently —->>>>

V_lV_h analysis

Signal & Control Regions in the fits

4 combinations of SR and CRs
to fit independently

W(1l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)
Z(2l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)
Z(0l) W(h) -> 2VBF + 2ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP, M_LP)

W(1l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag)
Z(2l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag)
Z(0l) Z(h) -> 2VBF + 4ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP_1tag, M_LP_1tag, M_HP_0tag, M_LP_0tag)

2L -> 15 SR and
1L -> 15 SR and
0L -> 10 SR

Overall 40 SRs

15 Z-CR
15 W-CR and 15 ttbar-CR

Overall 45 CRs

-> 15 scale factors* for Z+jet MC in each corresponding SR (**) and in 15 CRs
-> 15 scale factors* for W+jet MC in each corresponding SR (**) and in 15 CRs
-> 15 scale factors* for t-tbar MC in each corresponding SR (**) and in 15 CRs

* free in the fit, both for the background only hypothesis, and the Signal hypo
** of 0L, 1L and 2L, i.e. all 40 SR

fit for Background-only hypo OR ***Radion, Graviton -> WW, ZZ OR Z'(HVT)->WW***

ZZ+WW fit VBF

WW -> 3 SR +2(W-CR and tt-CR)x3 CRs
+
ZZ -> 5 SR +3 Z-CRs
8 SRs + 9 CRs

WW -> 3 SR +2(W-CR and tt-CR)x3 CRs
+
ZZ -> 10 SR +6 Z-CRs
13 SRs + 12 CRs

ZZ+WW fit ggF/DY

WZ fit VBF

ZW+WZ -> 8 SR +3+2x3 CRs
8 SRs + 9 CRs

ZW+WZ -> 11 SR +3+2x6 CRs
11 SRs + 15 CRs

WZ fit ggF/DY

fit for Background-only hypo OR ***W'(HVT)->WZ***

SIGNAL & CONTROL REGIONS IN THE FITS

- Signal Regions & Control Regions in the fit

W(1l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)
Z(2l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)
Z(0l) W(h) -> 2VBF + 2ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP, M_LP)

W(1l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag)
Z(2l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag)
Z(0l) Z(h) -> 2VBF + 4ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP_1tag, M_LP_1tag, M_HP_0tag, M_LP_0tag)

- ***ZZ+WW VBF fit***
  - SRs: 8
    - W(1L) W(h) -> VBF(M_HL, M_LP, Res) => 3
    - Z(2L) Z(h) -> VBF(M_HL, M_LP, Res) => 3
    - Z(0l) Z(h) -> VBF(M_HL, M_LP) => 2
  - CRs: 9
    - W(1L) W(h) -> VBF(M_HL, M_LP, Res) => 3 W-CR + 3 tt-CR
    - Z(2L) Z(h) -> VBF(M_HL, M_LP, Res) => 3 Z-CR

Signal & Control Regions in the fits

- Signal Regions & Control Regions in the fit

W(1l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)
Z(2l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)
Z(0l) W(h) -> 2VBF + 2ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP, M_LP)

W(1l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag)
Z(2l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag)
Z(0l) Z(h) -> 2VBF + 4ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP_1tag, M_LP_1tag, M_HP_0tag, M_LP_0tag)

- ***ZZ+WW ggF/DY fit***
  - SRs: 13
    - W(1L) W(h) -> ggF(M_HL, M_LP, Res) => 3
    - Z(2L) Z(h) -> ggF(M_HL_0tag, M_LP_0tag, Res_0tag) + ggF(M_HL_1tag, M_LP_1tag, Res_1tag) => 6
    - Z(0l) Z(h) -> ggF(M_HL_0tag, M_LP_0tag) + ggF(M_HL_1tag, M_LP_1tag) => 4
  - CRs: 12
    - W(1L) W(h) -> ggF(M_HL, M_LP, Res) => 3 W-CR + 3 tt-CR
    - Z(2L) Z(h) -> ggF(M_HL_0tag, M_LP_0tag, Res_0tag) + ggF(M_HL_1tag, M_LP_1tag, Res_1tag) => 6

Signal & Control Regions in the fits

- Signal Regions & Control Regions in the fit

W(1l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)
Z(2l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)
Z(0l) W(h) -> 2VBF + 2ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP, M_LP)

W(1l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag)
Z(2l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag)
Z(0l) Z(h) -> 2VBF + 4ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP_1tag, M_LP_1tag, M_HP_0tag, M_LP_0tag)

- ***WZ VBF fit***
  - SRs: 8
    - Z(2L) W(h) -> VBF(M_HP, M_LP, Res) => 3
    - Z(0L) W(h) -> VBF(M_HP, M_LP) => 2
    - W(1L) Z(h) -> VBF(M_HL, M_LP, Res) => 3
  - CRs: 9
    - Z(2L) W(h) -> VBF(M_HP, M_LP, Res) => 3 Z-CR
    - W(1L) Z(h) -> VBF(M_HL, M_LP, Res) => 3 W-CR + 3 tt-CR

SIGNAL & CONTROL REGIONS IN THE FITS

- Signal Regions & Control Regions in the fit

W(1l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)
Z(2l) W(h) -> 3VBF + 3ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP, M_LP, Res)
Z(0l) W(h) -> 2VBF + 2ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP, M_LP)

W(1l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag)
Z(2l) Z(h) -> 3VBF + 6ggF/DY = VBF(M_HL, M_LP, Res) + ggF(M_HP_1tag, M_LP_1tag, Res_1tag, M_HP_0tag, M_LP_0tag, Res_0tag)
Z(0l) Z(h) -> 2VBF + 4ggF/DY = VBF(M_HL, M_LP) + ggF(M_HP_1tag, M_LP_1tag, M_HP_0tag, M_LP_0tag)

- ***WZ ggF/DY fit***
  - SRs: 11
    - Z(2L) W(h) -> ggF(M_HP, M_LP, Res) => 3
    - Z(0L) W(h) -> ggF(M_HP, M_LP) => 2
    - W(1L) Z(h) -> ggF(M_HL_0tag, M_LP_0tag, Res_0tag) + ggF(M_HL_1tag, M_LP_1tag, Res_1tag) => 6
  - CRs: 15
    - Z(2L) W(h) -> ggF(M_HP, M_LP, Res) => 3 Z-CR
    - W(1L) Z(h) -> ggF(M_HL_0tag, M_LP_0tag, Res_0tag) + ggF(M_HL_1tag, M_LP_1tag, Res_1tag) => 6 W-CR + 6 tt-CR

Run the Reader

Code:

1. Code check-out on lxplus following the instruction: https://gitlab.cern.ch/CxAODFramework/CxAODReader_VVSemileptonic/-/tree/master/CxAODReader_VVSemileptonic
2. Code in home: /afs/cern.ch/user/c/chiodini/VV
3. Code replica in: /afs/cern.ch/work/c/chiodini/public/VV
4. Run on full MC/data set on condor with option tomorrow from configuration file
5. Output in /afs/cern.ch/work/c/chiodini/VV
6. Move output in /eos/user/c/chiodini//eos/user/c/chiodini/CONDOR_output

Data:

1. Derived CxAOD's are stored in /eos/user/r/rles/CxAOD/r33-08/
2. Organised in 3 different pair of jet collections (large jets R=1,small jet R=0.4):
   1. LCTopo_EMTopo
   2. TCC_EMTopo
   3. UFO_PFlow
3. See https://cds.cern.ch/record/2724842/files/ATL-PHYS-SLIDE-2020-238.pdf
4. 3 CXAOD derivations: HIGG2D4 (0Lep filter), HIGG5D1 (1Lep filter), HIGG5D2 (2Lep filter)
5. Samples organised in directory according to sample logical names: Diboson Wjets Zjets data15 data16 stop ttbar
6. Running directory: run
7. Commands stored in run.sh script for reference

Configuration files used

run.sh:

```
#WV1Lep
#ReadCxAODVVAnalysis -c data/CxAODReader_VVSemileptonic/WV1Lep_LCTopo_EMTopo.cfg -o /afs/cern.ch/work/c/
chiodini/VV/WV1Lep_LCTopo_EMTopo
#ReadCxAODVVAnalysis -c data/CxAODReader_VVSemileptonic/WV1Lep_TCC_EMTopo.cfg -o /afs/cern.ch/work/c/chiodini/
VV/WV1Lep_TCC_EMTopo
#ReadCxAODVVAnalysis -c data/CxAODReader_VVSemileptonic/WV1Lep_UFO_PFlow.cfg -o /afs/cern.ch/work/c/chiodini/
VV/WV1Lep_UFO_PFlow
#ZV2Lep
ReadCxAODVVAnalysis -c data/CxAODReader_VVSemileptonic/ZV2Lep_LCTopo_EMTopo.cfg -o /afs/cern.ch/work/c/
chiodini/VV/ZV2Lep_LCTopo_EMTopo
ReadCxAODVVAnalysis -c data/CxAODReader_VVSemileptonic/ZV2Lep_TCC_EMTopo.cfg -o /afs/cern.ch/work/c/chiodini/
VV/ZV2Lep_TCC_EMTopo
ReadCxAODVVAnalysis -c data/CxAODReader_VVSemileptonic/ZV2Lep_UFO_PFlow.cfg -o /afs/cern.ch/work/c/chiodini/VV/
ZV2Lep_UFO_PFlow
```

Changes in config file:

1. Select the right Derived CxAOD and pair of jet collections
2. string xSectionFileVV = data/CxAODReader_VVSemileptonic/XSections_13TeV.txt
3. Select the right analysis: ZV0Lep, W1Lep, ZV2Lep
4. Select the right btagging tool
5. Select the right jets and MET containers
6. Select the input samples
7. Select the number of events
8. Select direct run or batch run (I use condor with option tomorrow)
9. Set max output from histograms (like tree):
   int doHistStrategy = 3 #0=none, 1=MVVonly, 2=more, 3=all

B-tagging tool

```
## B-tagging configuration
## -------------------------
vector<string> bTagToolConfigs = MV2c10 85 AntiKt4EMTopoJets FixedCut # or FlatBEff
vector<string> bTagToolConfigsVR = MV2c10 85 AntiKtVR30Rmax4Rmin02TrackJets FixedCut
#string btaggingCDIfilename = 2017-21-13TeV-MC16-CDI-2018-10-19_v1 # October 2018
reccomendation
#string btaggingCDIfilename = /eos/atlas/atlascerngroupdisk/phys-higgs/HSG5/Run2/
BoostedVHbb2019/Custom_CDI/boosted-CDI-14-03-2019.root
string btaggingCDIfilename = /eos/atlas/atlascerngroupdisk/asg-calib/
xAODBTaggingEfficiency/13TeV/2017-21-13TeV-MC16-CDI-2019-07-30_v1.root
```

In order to avoid code error for “obsolete Btagging tool” I replaced with:

```
# B-tagging configuration
# -------------------------
#vector<string> bTagToolConfigs = MV2c10 85 AntiKt4EMTopoJets FixedCut # or FlatBEff
#vector<string> bTagToolConfigsVR = MV2c10 85 AntiKtVR30Rmax4Rmin02TrackJets FixedCut
vector<string> bTagToolConfigs =
SMALLR:MV2c10;85;AntiKt4EMTopoJets_BTagging201810;FixedCutBEff;D;AllSignalJets;BTAGMEDI
UM LARGER:MV2c10;85;AntiKtVR30Rmax4Rmin02TrackJet
s_BTagging201810;FixedCutBEff;D;AllSignalJets;BTAGMEDIUM
string btaggingCDIfilename = 2020-21-13TeV-MC16-CDI-2020-03-11_Sh228_v3
```

Jets and MET containers

LCTopo_EMTopo

```
string eventInfoContainer      = EventInfo
string muonContainer           = Muons
string electronContainer       = Electrons
string tauContainer            = TauJets
string photonContainer         = Photons
string jetContainer            = AntiKt4EMTopoJets_BTagging201810 #LCTopo_EMTopo #TCC_EMTopo
string fatJetContainer         = AntiKt10LCTopoTrimmedPtFrac5SmallR20Jets #LCTopo_EMTopo
string trackJetContainer       = AntiKtVR30Rmax4Rmin02TrackJets_BTagging201810 #LCTopo_EMTopo
#TCC_EMTopo
string METContainer            = MET_Reference_AntiKt4EMTopo #LCTopo_EMTopo  #TCC_EMTopo
string MPTContainer            = MET_Track
string truthParticleContainer = TruthParticles
string truthVertexContainer   = TruthVertices
```

TCC_EMTopo

```
…
string jetContainer            = AntiKt4EMTopoJets_BTagging201810 #LCTopo_EMTopo #TCC_EMTopo
string fatJetContainer         = AntiKt10TrackCaloClusterTrimmedPtFrac5SmallR20Jets #TCC_EMTopo
string trackJetContainer       = AntiKtVR30Rmax4Rmin02TrackJets_BTagging201810 #LCTopo_EMTopo
#TCC_EMTopo
string METContainer            = MET_Reference_AntiKt4EMTopo #LCTopo_EMTopo #TCC_EMTopo
…
```

UFO_PFlow

```
…
string jetContainer            = AntiKt4EMPFlowJets_BTagging201810 #UFO_PFlow
string fatJetContainer         = AntiKt10UFOCSSKSoftDropBeta100Zcut10Jets #UFO_Flow
string trackJetContainer       = AntiKt2PV0TrackJets_BTagging201810 #UFO_PFlow
string METContainer            = MET_Reference_AntiKt4EMPFlow #UFO_PFlow
…
```

Modified code

In order to study jets variable after preselection but before V_h tagging and mass, and D2 cuts

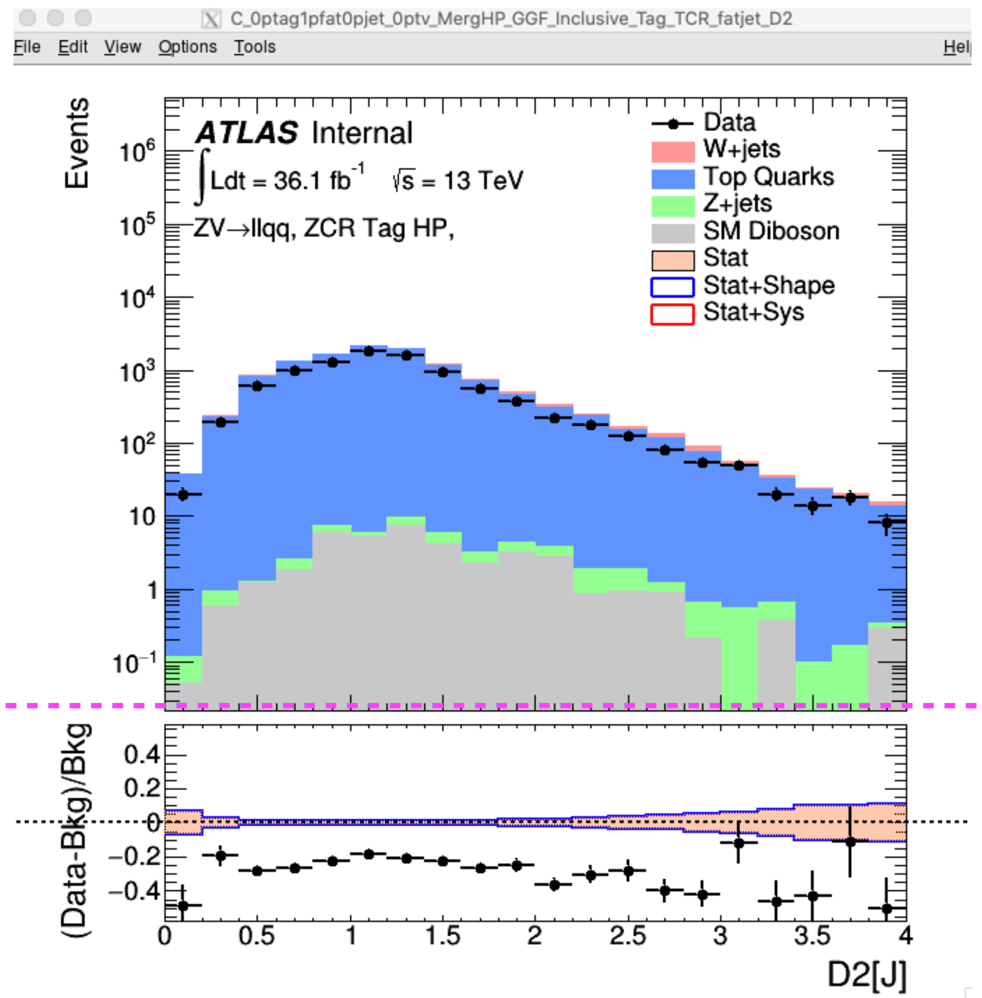
AnalysisReaderWZ1Lep.cxx and AnalysisReaderZV2Lep.cxx

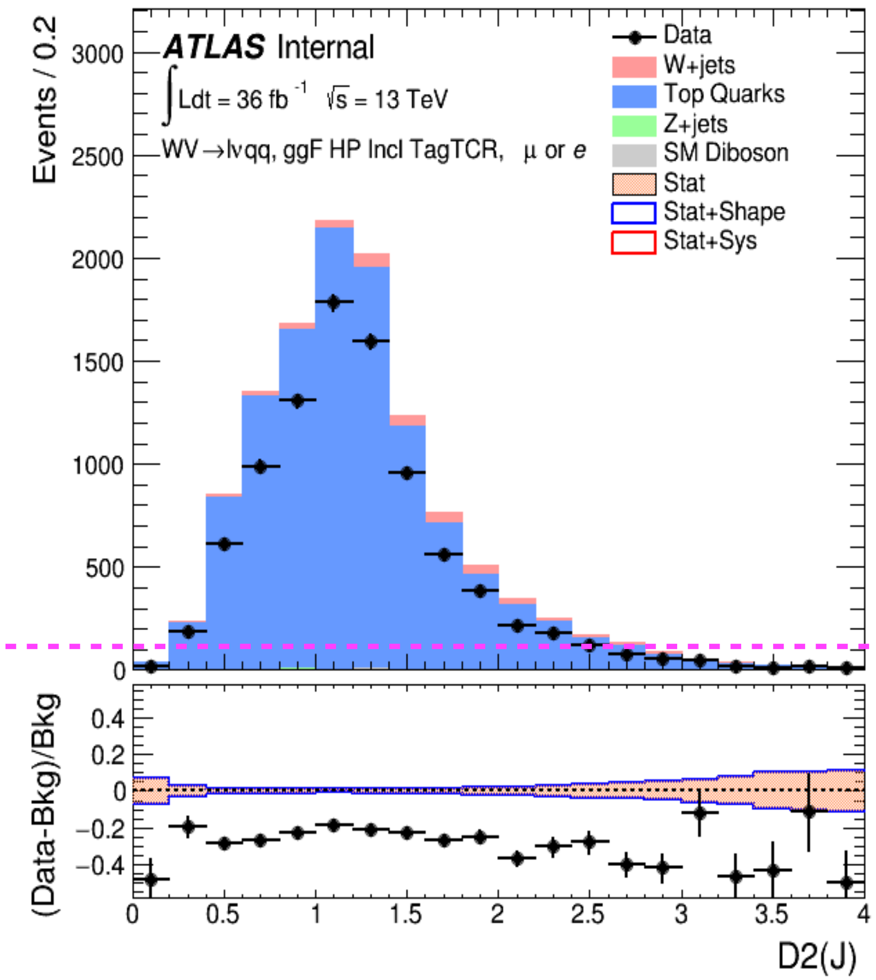
```
//Do W/Z-tagging
bool pass_isWJet = Props::passWMassCut.get(fatjet) && Props::passWSubstructure.get(fatjet);
bool pass_isZJet = Props::passZMassCut.get(fatjet) && Props::passZSubstructure.get(fatjet);
pass_isWJet = true;
bool pass_isWJetLP = Props::passWMassCut.get(fatjet) && !Props::passWSubstructure.get(fatjet);
bool pass_isZJetLP = Props::passZMassCut.get(fatjet) && !Props::passZSubstructure.get(fatjet);
bool pass_isWZJet = pass_isWJet || pass_isZJet;
bool pass_isWZJetLP = pass_isWJetLP || pass_isZJetLP;
```

Compare WV1Lep with Yassine

Plots produced with: root -l CxAODReader_VVSemileptonic/macros/runCxAODPlots_Syst.cxx
after changing runCxAODPlots_Syst.cxx (I/O), makePlots2Lepton_Syst.cxx (loop on plot names) and PlottingTool//core/Config.cxx (initial state -> final state)

```
(sample)_0ptag1pfat0pjet_0ptv_MergHP_GGF_Inclusive_Tag_TCR_fatjet_D2->Draw();
```





From my
WV1Lep_LCTopo_EMTopo.cfg

Send it today to me from Yassine.
Yassine included ttbar non all hadronic (410470) and ttbar dilepton samples (410472) because ttbar all hadronic samples were missing (DSIS = 410471)