

# ZZjj distribution with Dim8 operators (draft)

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# Outline

- 1 Delphes3 fast Sim Comparison between SM and Dim8

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# ZZjj Cross section results with dim8 operators

EWK zzjj total cross sections

Dim8 Operator	Cross Section (pb)
Standard Model	$0.1326 \pm 0.00035$
FT8 = $10^{-10}$	$654.3 \pm 5.3$
FT9 = $10^{-10}$	$139.6 \pm 0.36$
<b>FM2 = <math>10^{-10}</math></b>	<b><math>4.151 \times 10^5 \pm 8.6 \times 10^2</math></b>
FM3 = $10^{-10}$	$3.58 \pm 0.0051$
FT8 = $10^{-11}$	$6.384 \pm 0.046$
FT9 = $10^{-11}$	$0.6933 \pm 0.04946$
FM2 = $10^{-11}$	$4149 \pm 7.8$
FM3 = $10^{-11}$	$0.1653 \pm 0.00039$

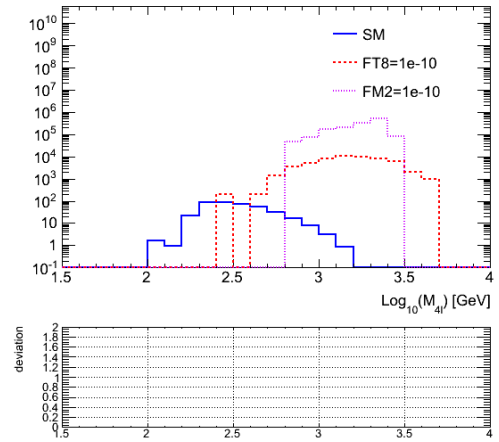
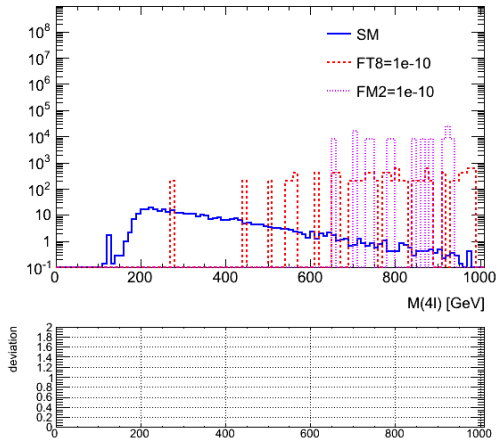
# ZZjj Cross section results with dim8 operators: fully leptonic

EWK zzjj cross sections in fully leptonic decay channels.

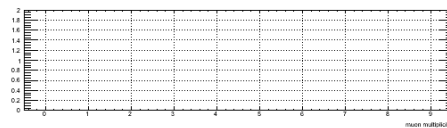
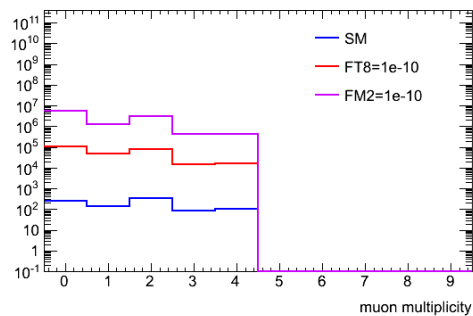
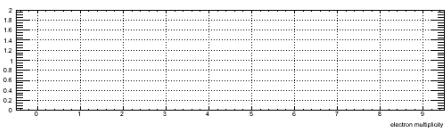
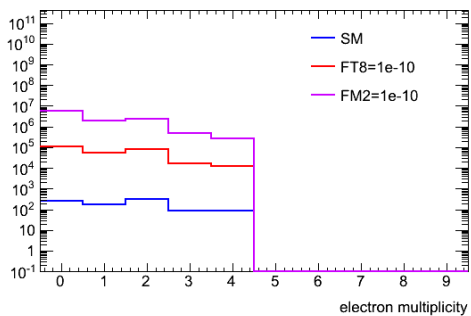
Dim8 Operator	Cross Section (pb)
Standard Model	$0.0003079 \pm 3.825 \times 10^{-7}$
FS0 = $10^{-10}$	$0.0004673 \pm 7.366 \times 10^{-7}$
FS1 = $10^{-10}$	$0.0005731 \pm 7.594 \times 10^{-7}$
FT8 = $10^{-10}$	$0.09122 \pm 1.715 \times 10^{-4}$
FT9 = $10^{-10}$	$0.02025 \pm 2.581 \times 10^{-5}$
<b>FM2 = <math>10^{-10}</math></b>	<b><math>3.565 \pm 1.266 \times 10^{-4}</math></b>
FM3 = $10^{-10}$	$0.0006426 \pm 7.18 \times 10^{-7}$
FS0 = $10^{-11}$	$0.0003091 \pm 3.9 \times 10^{-7}$
FS1 = $10^{-11}$	$0.0003107 \pm 4 \times 10^{-7}$
FT8 = $10^{-11}$	$0.00121 \pm 2.273 \times 10^{-6}$
FT9 = $10^{-11}$	$0.0005028 \pm 7.085 \times 10^{-7}$
FM2 = $10^{-11}$	pending...
FM3 = $10^{-11}$	pending...

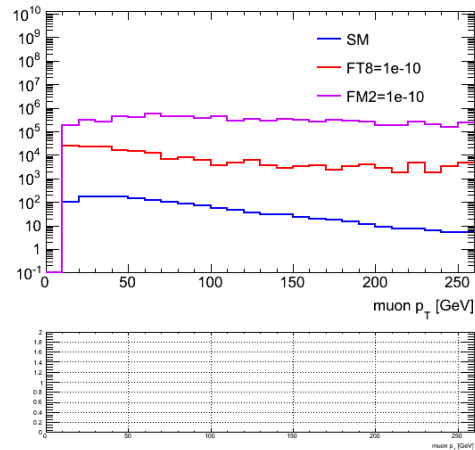
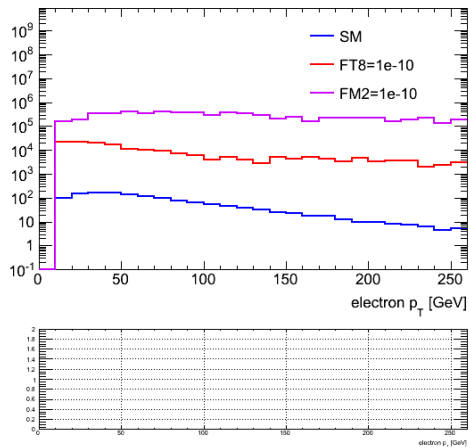
- Low statistics: only 1k events ( 1% efficiency due to divergence?)
- **FM2 gives the best sensitivity. Only 2 derivatives in FMx while we have 4 derivatives in FTx. Expected?**
- Comments from Ashutosh: we should give up FSx operators because they don't operate on gauge fields as indicated in the lagrangians

## 4-Lepton Mass

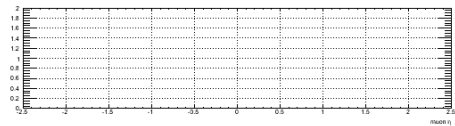
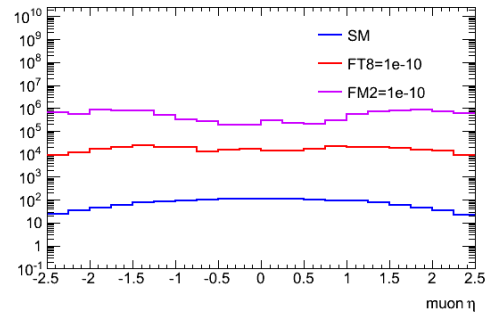
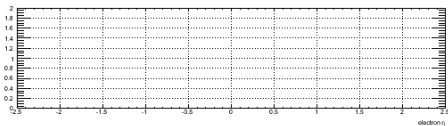
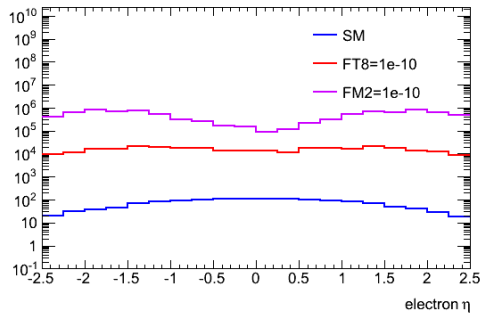


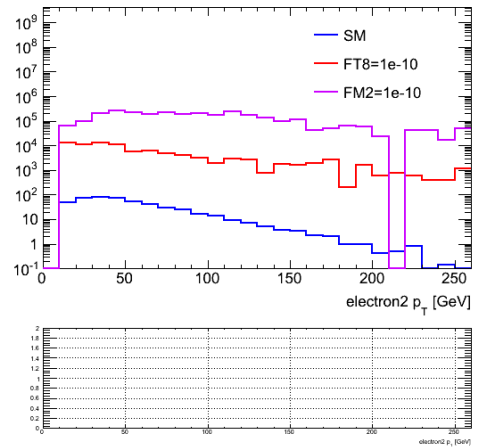
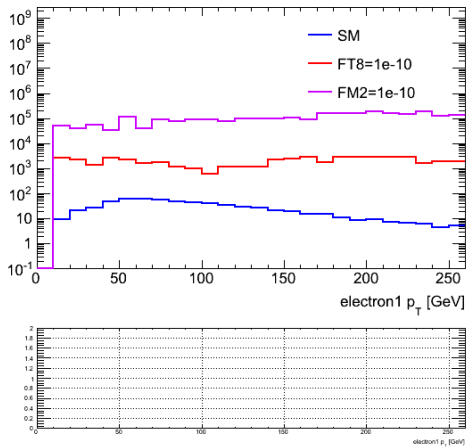
## Lepton Multiplicity

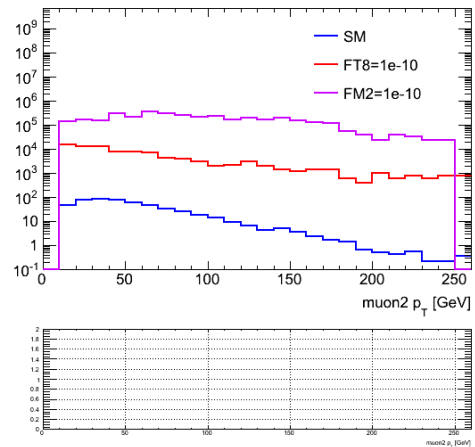
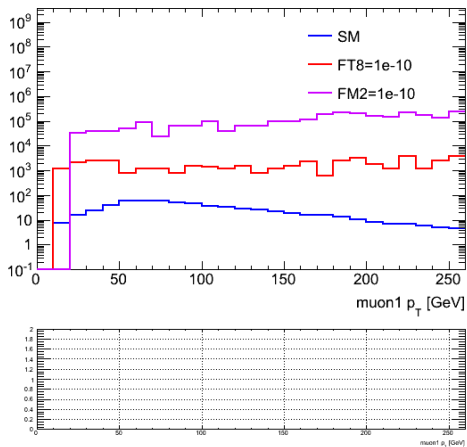


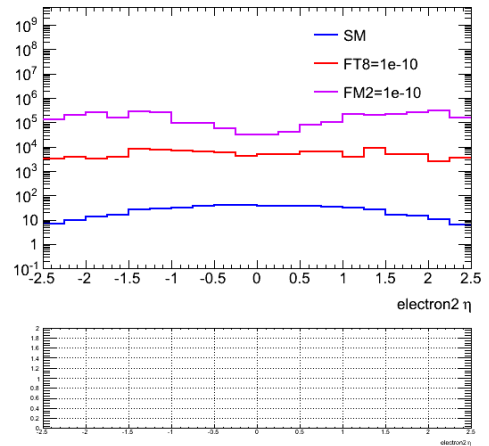
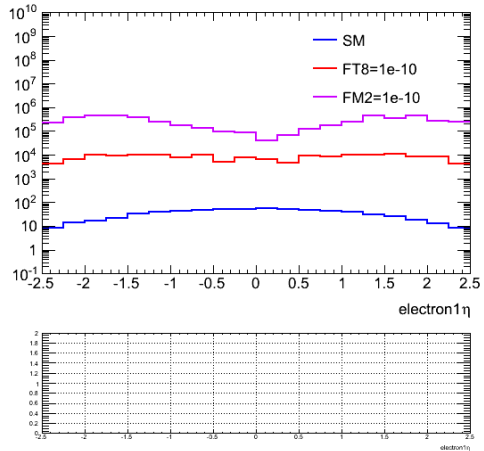
Lepton  $p_T$  spectra

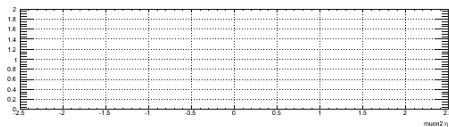
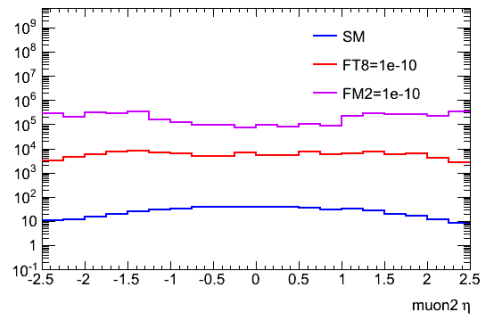
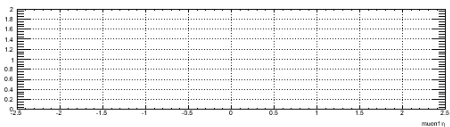
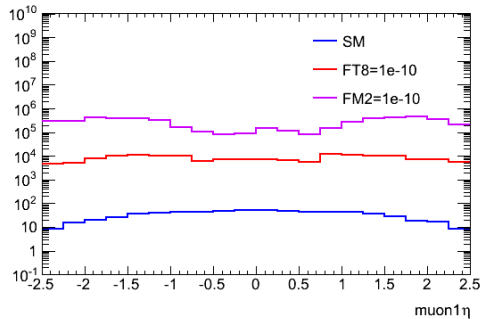


Lepton  $\eta$  spectra

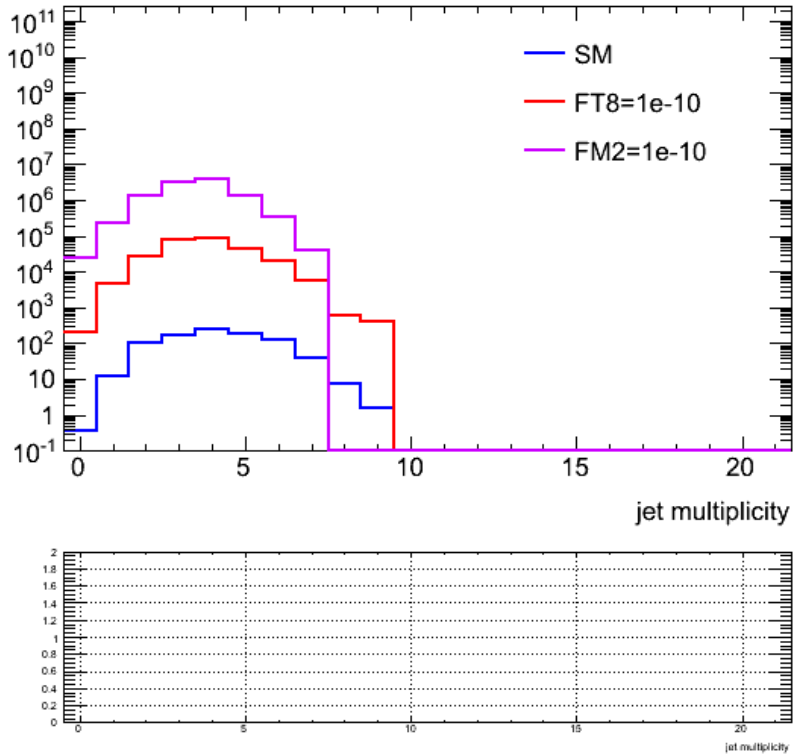
Electron  $p_T$ 

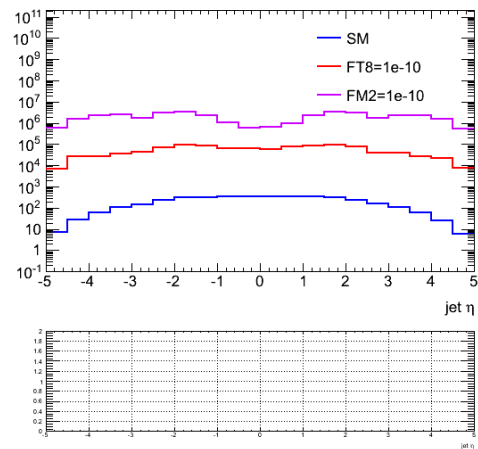
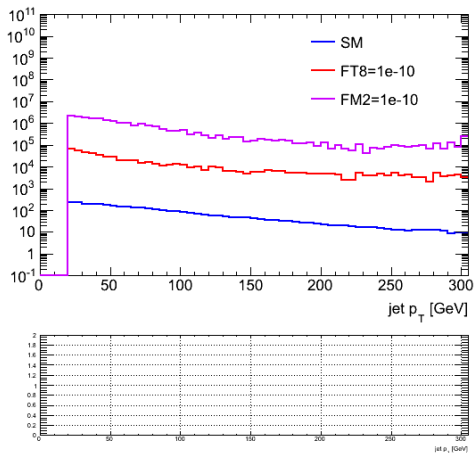
Muon  $p_T$ 

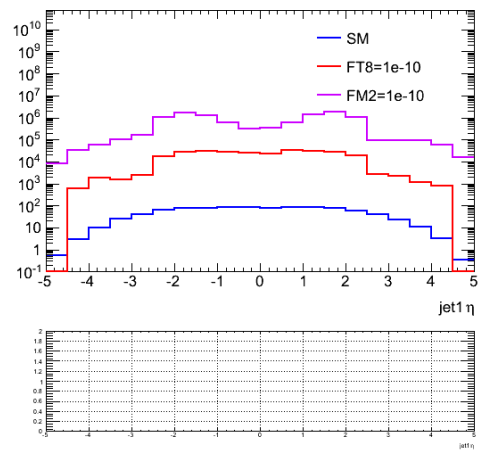
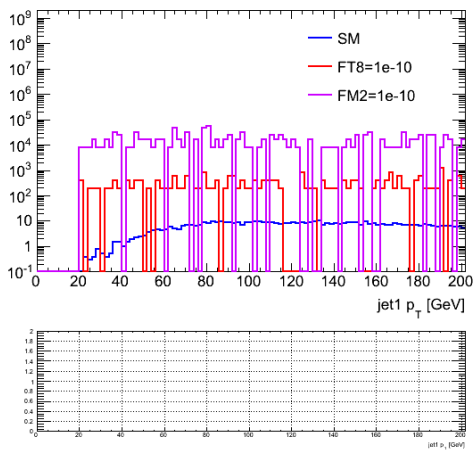
Electron  $\eta$ 

Muon  $\eta$ 

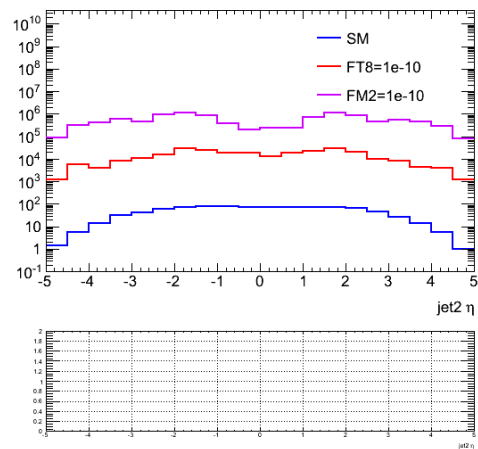
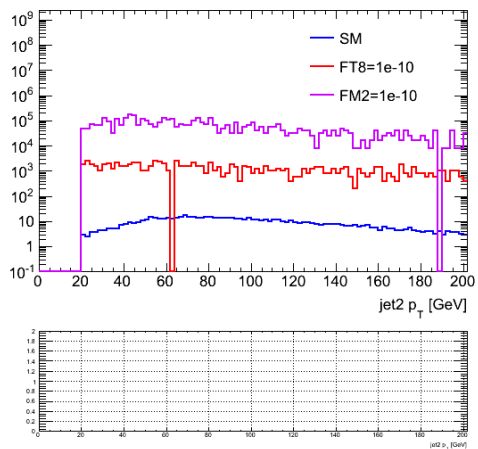
## Jet Multiplicity

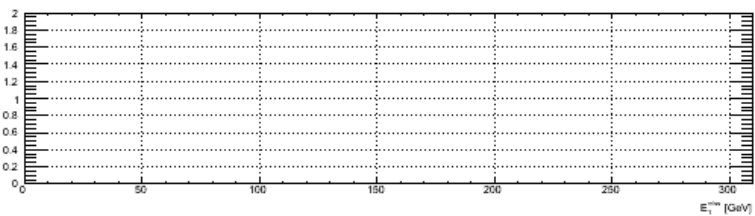
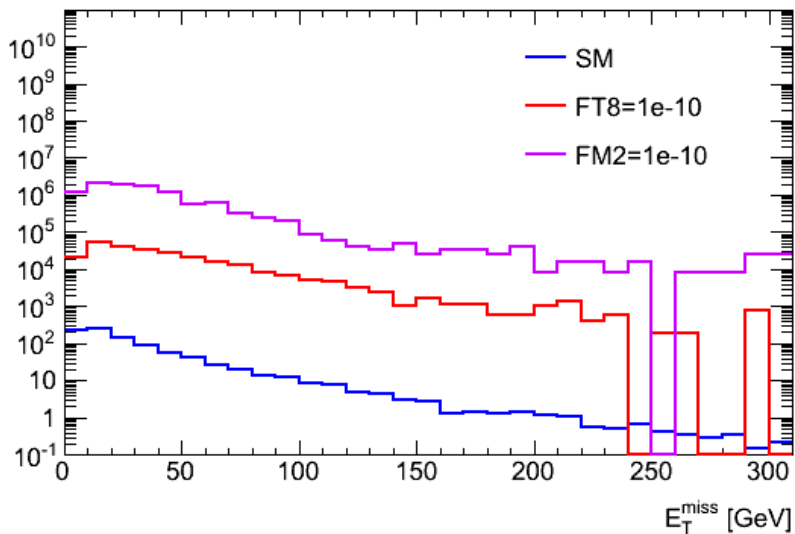


All Jet  $p_T$  and  $\eta$ 

Leading Jet  $p_T$  and  $\eta$ 



Subleading Jet  $p_T$  and  $\eta$ 

Missing  $E_T$ 

## Quick summary

- Cross section results and kin. distributions of  $ZZjj$  are basically in place
- Suspicious divergence happen to this channel, very low eff. No fast turn around when trying to (re-)produce the signal samples ( $\approx 8h/kEvts$ )
- Limit setting is ready to work with  $ZZjj$  channel. Will try  $WZjj$  soon as it doesn't have the divergence
- More choices:
  - LS0,LS1:  $wwjj, wzjj, zzjj$
  - LM0,LM1:  $wwjj, wzjj, zzjj, wajj, zajj, waa, wwa, zaa, zza, www, wwz, zzz$
  - LM2,LM3:  $wwjj, wzjj, zzjj, wajj, zajj, waa, wwa, zaa, zza, wwz, zzz$
  - LT8,LT9:  $zzjj, zajj, zaa, zza, zzz$