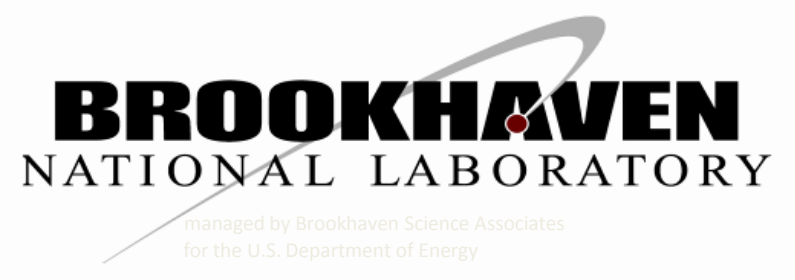


Snowmass EWK

Jessica Metcalfe, Marc-Andre Pleier

VBS

aQGC signal generation

Goal: to produce aQGC signal samples for VV processes

Use madgraph and previous experience with vbfnlo:

1) cross-check previous madgraph results from Shu (EWdim6)
2) compare ssWW channel in madgraph and vbfnlo in extended phase space region for different machine energies (EWdim6)
   - This region is defined by the ATLAS SM EW VBS

Leptons:	Jets:	
pT > 10 GeV	pT > 20 GeV	m_{jj} > 150 GeV
$\|\eta\| < 5$	$\|\eta\| < 5$	

3) Move to dimension 8 models, specifically SM_LS0_LS1_UFO
   - Tune anomalous coupling constants $L_{S,0}$ and $L_{S,1}$

VBS

1) Cross-check with Shu's previous results for ZZ jj:
   - Picked two random processes to compare
     - SM
     - Cphiw = 50
   - Results are basically the same

EWdim6

Cross-check with Shu:		
zz jj		
	SM	Cphiw=50
Shu	1.33E-01	9.24E-01
Jessica	0.1334	0.9247

VBS

2) Compare MadGraph and VBFNLO

- MadGraph and VBFNLO results agree within a few percent depending on machine energy

Note: • MadGraph cross-sections are listed in pb and VBFNLO in fb

• VBFNLO results need to be multiplied by 4 to correct for number of channels produced: VBFNLO: W+W+ -> e+e+ pairs only, MadGraph: W+W+ -> (ee ee), (ee mumu) (mumu ee) (mumu mumu)

EWdim6

CM beam Energy:

		13 TeV	14 TeV	30 TeV	33 TeV	100 TeV
MadGraph (pb)	xsec (pb)	0.007481	0.008662	0.03355	0.03923	0.1727
W+W+ -> l+ vl	error	1.70E-05	2.00E-05	7.50E-05	7.40E-05	3.00E-04
l+ = e+ mu+						
VBFNLO (fb)	LO xsec (fb)	1.895	2.202	8.695	10.149	46.34
W+W+ -> e+e+	error	1.10E-03	1.40E-03	5.80E-03	7.50E-03	4.00E-02
	NLO xsec	1.956	2.276	9.21	10.79	52
	error	1.80E-03	2.30E-03	1.20E-02	1.20E-02	1.20E-01
VBFNLO x 4	LO xsec	7.58	8.808	34.78	40.596	185.36
	error	0.0044	0.0056	0.0232	0.03	0.16
	NLO xsec	7.824	9.104	36.84	43.16	208
	error	0.0072	0.0092	0.048	0.048	0.48
MadGraph - VBFNLO	LO:	1%	2%	4%	3%	7%
% difference	NLO:	5%	5%	10%	10%	20%

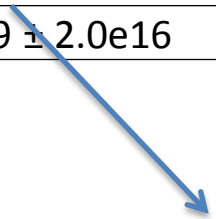
VBS

3) Switch to EWdim8 SM_LS0_LS1_UFO model

- $L_{S,0}$ =0 and $L_{S,1}$ =0 comparable to EWdim6 model
- the cross-section blows up with anomalous couplings on

x-sec (pb)

	FS1 = 0	FS1 = 1
FS0 = 0	0.007792 ± 1.8e-5	1.257e18 ± 2.2e15
FS0 = 1	1.141e19 ± 2.0e16	2.039e19 ± 3.4e16

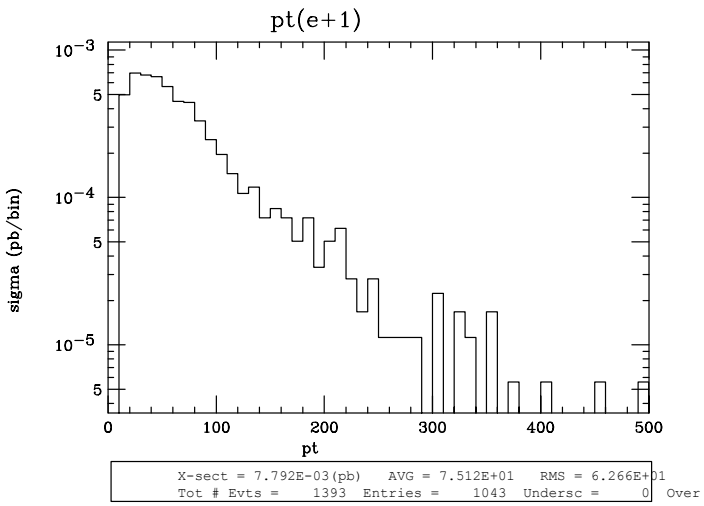


Compare to EWdim6 model: 0.008662 ± 2e-5 pb

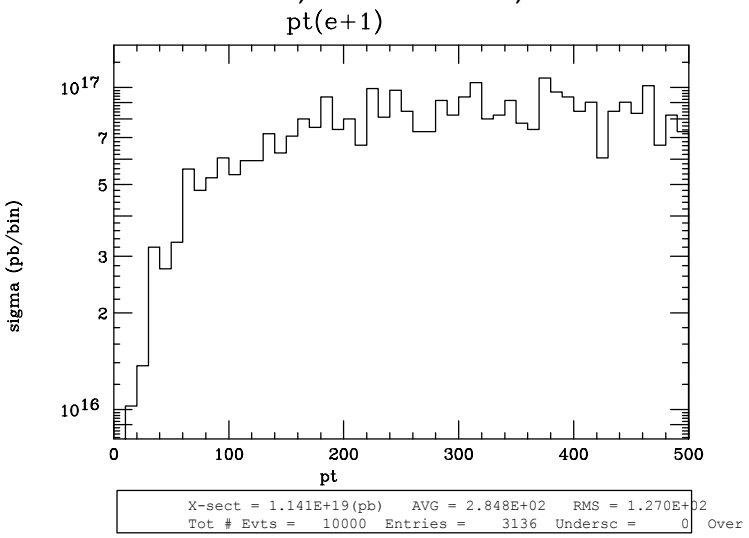
VBS

3) SM_LS0_LS1_UFO model, e_1 $p_{T:}$

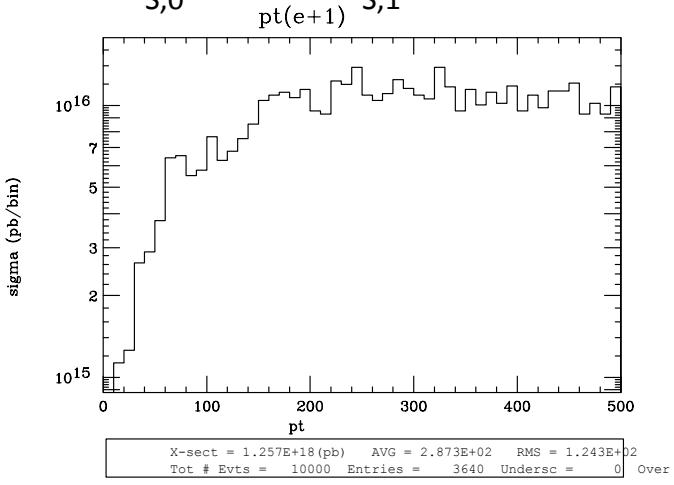
$L_{S,0}$ =0 and $L_{S,1}$ =0



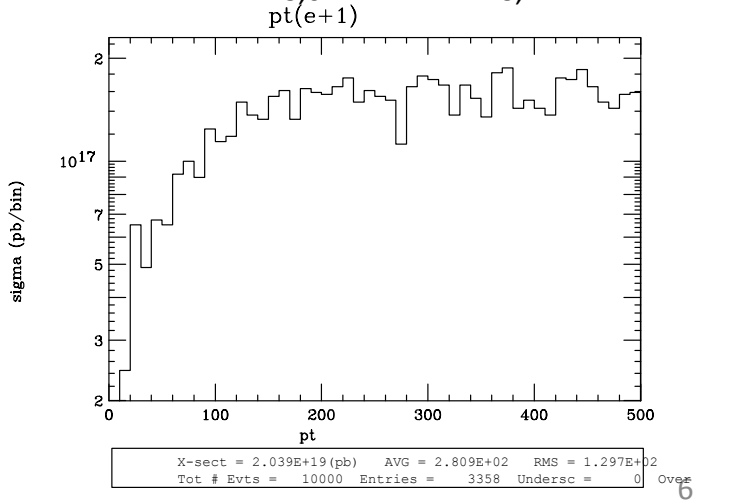
$L_{S,0}$ =1 and $L_{S,1}$ =0



$L_{S,0}$ =0 and $L_{S,1}$ =1

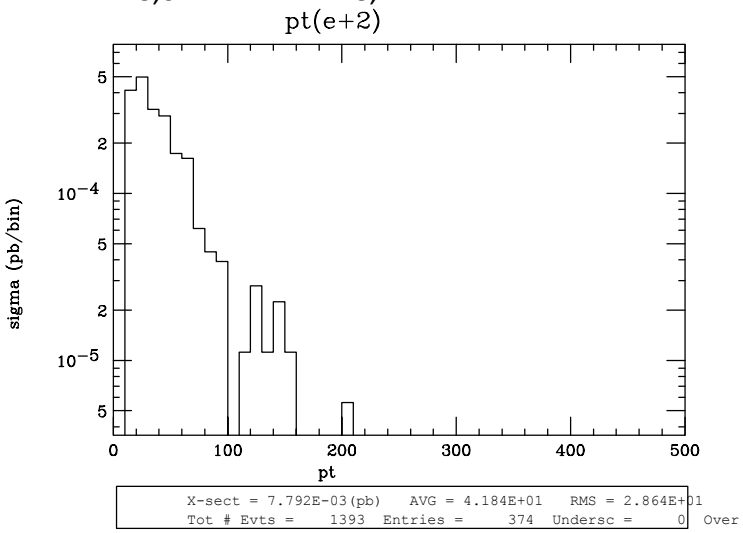


$L_{S,0}$ =1 and $L_{S,1}$ =1

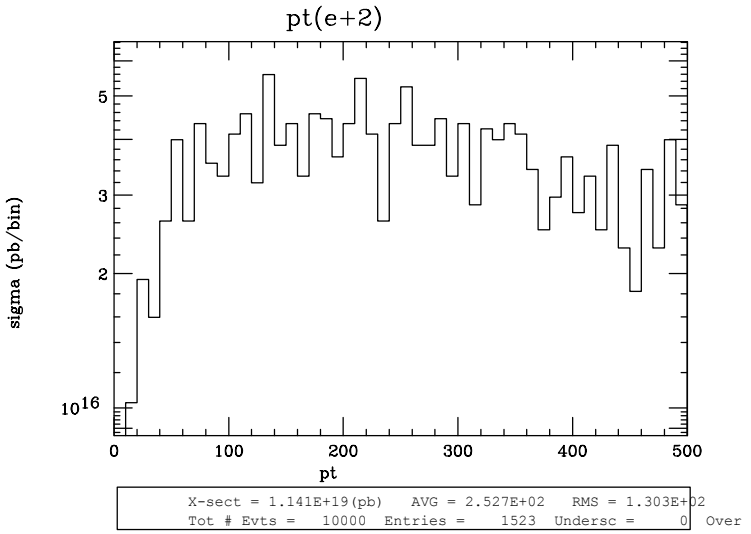


3) SM_LS0_LS1_UFO model, e_2 $p_{T:}$

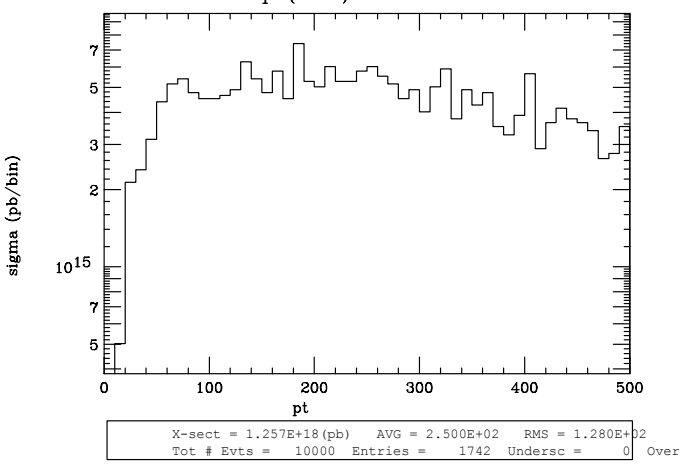
$L_{S,0}$ =0 and $L_{S,1}$ =0



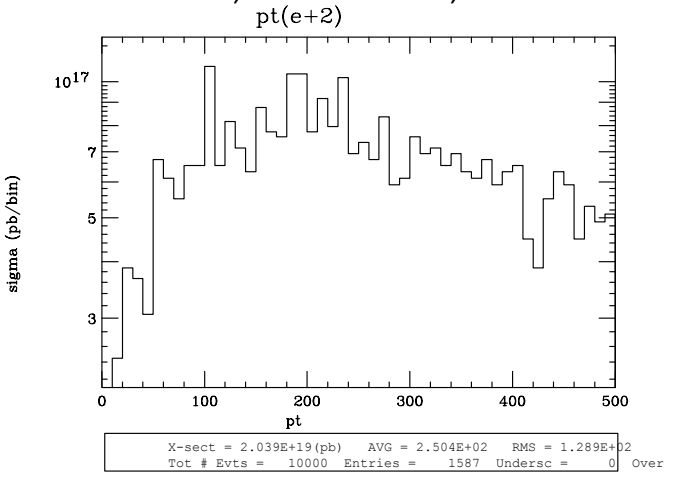
$L_{S,0}$ =1 and $L_{S,1}$ =0



$L_{S,0}$ =0 and $L_{S,1}$ =1



$L_{S,0}$ =1 and $L_{S,1}$ =1



VBS

- Consistent results using MadGraph with Shu
- Consistent results with MadGraph and VBFNLO
  - For various machine energies, within 1-7%
- Similar results with EWdim6 and EWdim8 models

Next:

- Start looking at values of $L_{S,0}$ and $L_{S,1}$ between 0 and 1