

Studies on boson+jets and multi-boson simulation in ATLAS

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The Monte Carlo setups used by ATLAS to model boson+jets ($V+jets$) and multi-boson ($VV/VVV+jets$) processes at $\sqrt{s}=13$ TeV for pp collisions are described. Comparisons between data and several events generators are provided for key kinematic distributions. Issues associated to the evaluation of systematic uncertainties are also discussed.

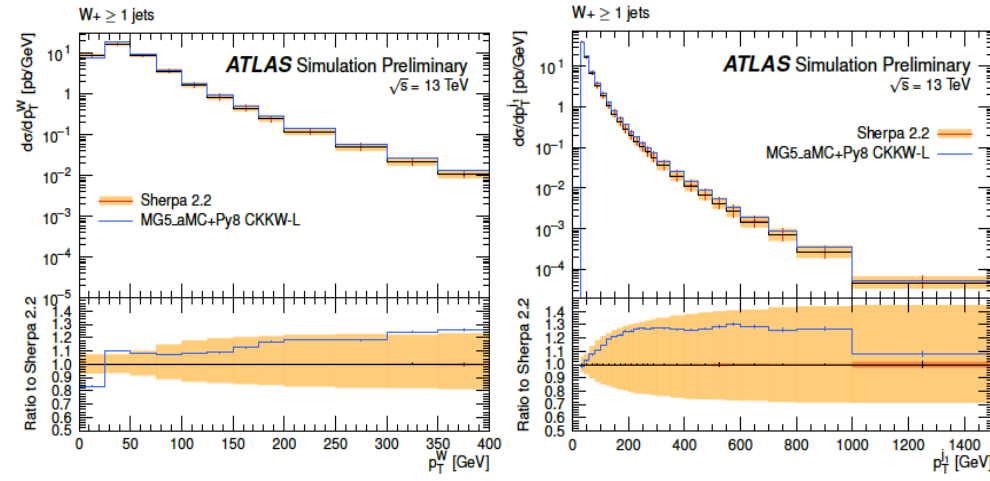
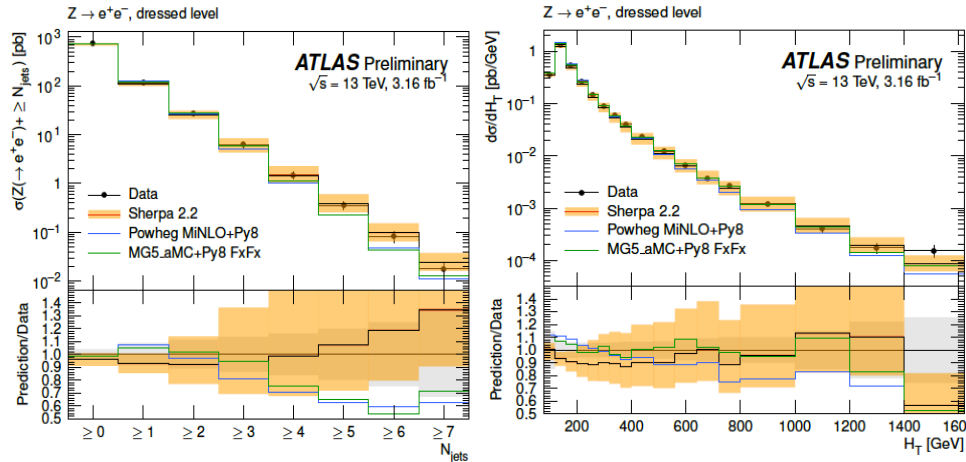


- ✓ **Sherpa2.2:** $V + 0,1,2j$ @NLO, + $3,4j$ @LO (NNPDF30nlo, $\alpha_s = 0.118$); NLO CKKW merging ($\mu_Q = 20$ GeV)
- ✓ **Madgraph+PY8 CKKW-L:** CKKW-L merging ($\mu_Q = 30$ GeV); $0,1,2,3,4j$ @LO (NNPDF30nlo, $\alpha_s = 0.118$). A14 tune
- ✓ **Madgraph+PY8 FxFx:** $V + 0,1,2j$ @NLO (NNPDF23nlo, $\alpha_s = 0.119$). FxFx merging ($\mu_Q = 25$ GeV) and A14 tune
- ✓ **Powheg MINLO:** Improved CKKW matching @NLO for $V + 1j$ (CT14nlo). Interfaced to Pythia8 (AZNLO tune, CTEQ6L1 LO)
- ✓ **ALPGEN:** LO ME ($0 - 5j$) merged with the MLM prescription ($\mu_Q = 20$ GeV). Perugia2011C PY6 tune (CTEQ6L1 LO)

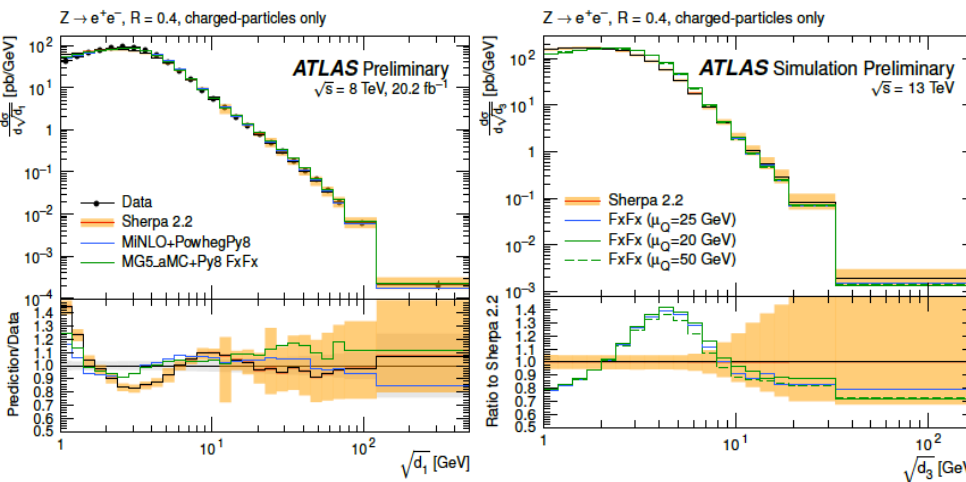
Single boson production + jets (ATL-PHYS-PUB-2017-006)

W+jets @13 TeV

Z+jets @13TeV [arXiv:1702.05725]

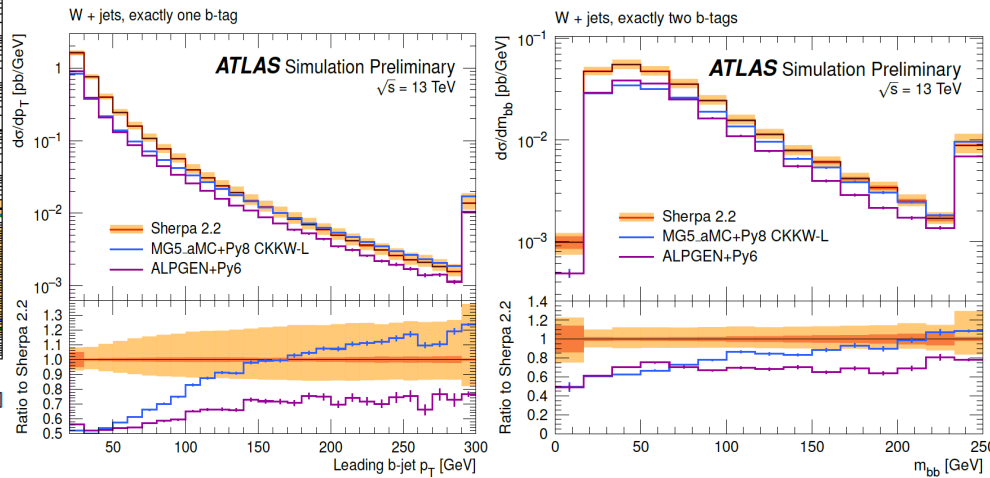


k_T splitting scales @8 TeV [arXiv:1704.01530]



V+b(b) jets @13 TeV:

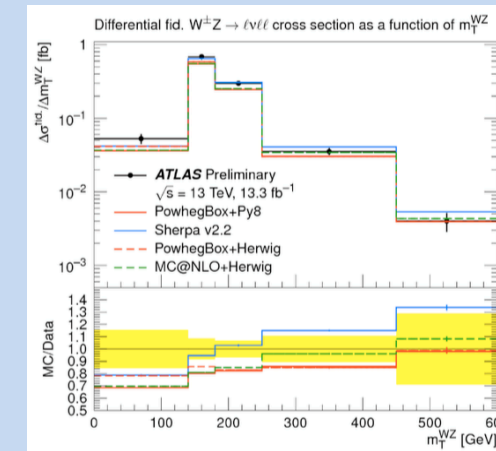
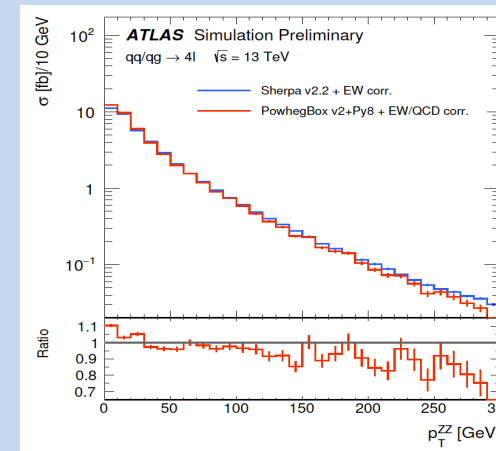
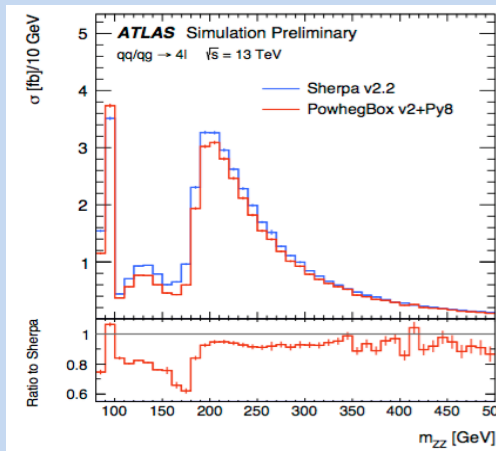
- 1) Benchmarking MCs (e.g. gluon splitting in $b\bar{b}$)
- 2) One of the largest bkg for searches
- 3) Bkg for SM $VH(\rightarrow b\bar{b})$ process



Multi-boson processes (ATL-PHYS-PUB-2017-005) WZ+jets @13 TeV [arXiv:1606.04017]

Fully leptonic VV/WZ+jets:

- Sherpa 2.2 + OpenLoops: $4l + 0,1j$ @NLO, + $2,3j$ @LO (NNPDF30nlo)
- Sherpa + NLO EW corr: arXiv:1601.07787, arXiv:1611.05338
- PowhegBox + PY8: $4l + 0j$ @NLO (CT10nlo)
- MC@NLO 4.0 + HERWIG++/JIMMY: $3l\nu + 0j$ @NLO (CT10)



Semileptonic VV+jets:

- Sherpa 2.2 + OpenLoops: $llqq + 0,1j$ @NLO, + $2,3j$ @LO (NNPDF30nlo)
- Sherpa 2.1.1 + OpenLoops: $llqq + 0j$ @NLO, + $1,2,3j$ @LO (CT10nlo)
- PowhegBox + PY8/HERWIG++: $2l2j + 0j$ @NLO (CT10nlo)

Vγ + jets:

- Sherpa 2.1.1: $V\gamma + 0,1,2,3j$ @LO
- aMC@NLO+ PY8: $V\gamma + 0,1,2,3j$ @LO (factorised on-shell decays)

Electroweak qq → VVjj:

	VV + 2j	VV + 3j	VV + ≥ 4j
VVjj = t [±] t [±] 2νjj	VBFNLO+PYTHIA8	LO	PS
VVjj = t [±] t [±] 2νjj	MadGraph5_aMC@NLO+PYTHIA8	LO	PS
VVjj = t [±] t [±] 2νjj	Sherpa	LO	PS
VVjj = t [±] t [±] 2νjj	PowhegBox+PYTHIA8	NLO	LO
VVjj = tt[lv]ννjj	Sherpa	LO	PS
VVjj = tt[lv]ννjj	MadGraph5_aMC@NLO+PYTHIA8	LO	PS
VVjj = tt[lv]ννjj	Sherpa	LO	PS
Zγjj = 2lγjj	VBFNLO+PYTHIA8	LO	PS
Zγjj = 2lγjj	MadGraph5_aMC@NLO+PYTHIA8	LO	PS

