

# ATLAS experience and wishlist

**Christian Gütschow**

on behalf of the ATLAS collaboration

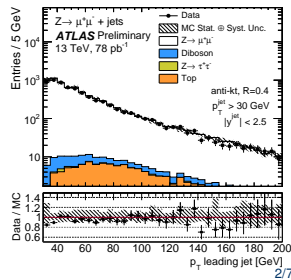
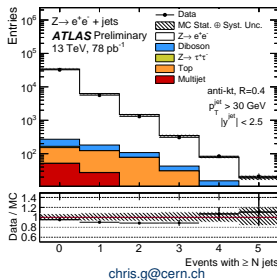
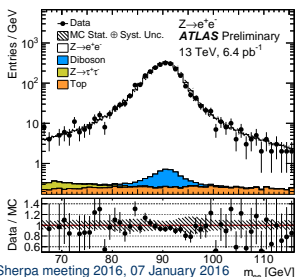
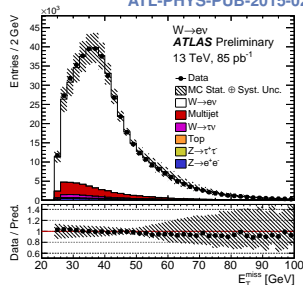
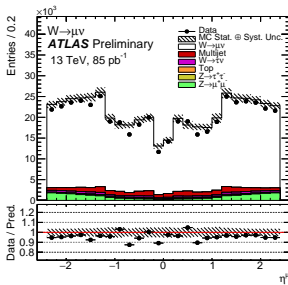
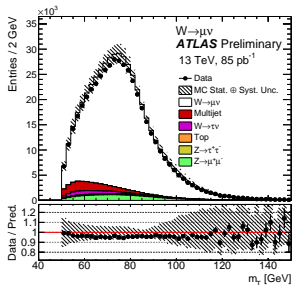
**Sherpa meeting 2016**

**07 January 2016**



# Rediscovering the Standard Model at 13 TeV

ATLAS-CONF-2015-039  
ATL-PHYS-PUB-2015-021



## Overview

$Z$  + jets cross-section measurement (ATLAS-CONF-2015-041)  
 $W$  and  $Z$  cross-section measurements (ATLAS-CONF-2015-039)  
Inclusive photon studies (ATL-PHYS-PUB-2015-016)  
 $W$  and  $Z$  studies (ATL-PHYS-PUB-2015-021)  
Top-antitop cross-section measurement and ratio to  $Z$  (ATLAS-CONF-2015-049)  
Top-antitop cross-section measurement (ATLAS-CONF-2015-033)  
Top kinematic distributions (ATL-PHYS-PUB-2015-017)  
Lepton + jets search (ATLAS-CONF-2015-046)  
Monojet performance plots (EXOT-2015-005)  
Higgs 4-lepton cross-section measurement (ATLAS-CONF-2015-059)  
Higgs 2-photon cross-section measurement (ATLAS-CONF-2015-060)  
Search for MSSM Higgs decays to  $\tau\tau$  (ATLAS-CONF-2015-061)  
Search for SUSY with events with 0-leptons, jets and MET (ATLAS-CONF-2015-062)  
Search for sbottom with two  $b$ -jets and MET (ATLAS-CONF-2015-066)  
Search for gluino-mediated stop and sbottom with events with  $b$ -jets, jets and MET (ATLAS-CONF-2015-067)  
Search for SUSY with events with 1-lepton, jets and MET (ATLAS-CONF-2015-076)  
Search for SUSY with events with 0-leptons, multijets and MET (ATLAS-CONF-2015-077)  
Search for SUSY with events with two same-sign leptons, jets and MET (ATLAS-CONF-2015-078)  
Search for SUSY with events with two opposite-sign leptons, jets and MET (ATLAS-CONF-2015-082)  
top-antitop + jets cross-section measurement (ATLAS-CONF-2015-065)  
 $t$ -channel single top cross-section measurement (ATLAS-CONF-2015-079)  
Search for new physics in the lepton + MET channel (ATLAS-CONF-2015-063)  
Search for diboson resonances in the MET + jet channel (ATLAS-CONF-2015-068)  
Search for new physics in the dilepton channel (ATLAS-CONF-2015-070)  
Search for diboson resonances in the  $llqq$  channel (ATLAS-CONF-2015-071)  
Search for new physics with LFV decays to  $e + \mu$  (ATLAS-CONF-2015-072)  
Search for diboson resonances in  $W/Z$  + Higgs channels (ATLAS-CONF-2015-074)  
Search for diboson resonances in the  $\ell\nu qq$  channel (ATLAS-CONF-2015-075)  
Search for dark matter in the MET +  $W/Z$  channel (ATLAS-CONF-2015-080)

## Production issues

- ATLAS has never successfully gone through a bug-free Sherpa production campaign
- Every time a bug of some type caused rather significant physics issues
  - not showering MPI partons
  - too much forward activity
  - crazy heavy flavour rates
  - ...

## Event weights

- Some events come with large NLO weights that are negative
  - double hit from negative weights and large magnitude
- Tails are problematic where weights of up to few hundred get through
- Pragmatic solution desirable that allows to truncate the large weights without spoiling the accuracy
- If we are really sensitive to areas of phase space with weights  $\sim 500$ , then there is not much we can do about it because we can never generate enough events there

## Speed issues

- Quite a struggle
- Some tricks with the scales help (courtesy of Frank Siegert)
- $V +$  jets suffers immensely compared to LO production of Run I
  - slow speed meant we could not enhance with jet multiplicity or tighten the  $B$ -filter
  - also suffered from large number of soft heavy hadrons that do not reach the detector/ $b$ -tagging (better in v2.2?)
  - $\sim 20\%$  negative and weights large in magnitude
- Anything else that could help make it run faster would be a huge benefit!

## Summary

- Very pleased to see that Sherpa v2.1 describes the data much better than v1.4.5
- Hoping to see fewer 'surprises' during Sherpa production campaigns in the future
- Large & negative NLO weights are a problem, especially in the tails
- Any improvements regarding generation speed are highly desirable
- Keen to have EW corrections implemented (crucial for precision measurements)