ATLAS and CMS cross-sections for WW in a common phase space
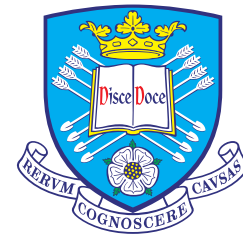
Kristin Lohwasser, Guillelmo Gomez Ceballos Retuerto
University of Sheffield, MIT

On behalf of the ATLAS/CMS analysis teams

WW cross sections at √s = 13 TeV

> **ATLAS measurement at 13 TeV (36 /fb, 2015-2016 data)**
  - https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/PAPERS/STDM-2017-24/
  - https://www.hepdata.net/record/ins1734263
  - https://rivet.hepforge.org/analyses/ATLAS_2019_I1734263

> **CMS measurement at 13 TeV (36/fb, 2015-2016 data)**
  - http://cds.cern.ch/record/2714766

> **Very different cuts, as per usual, but plenty of nice differential distributions**
  → **But this is not the usual problem**

Selection requirement	Selection value
p_T^ℓ	> 27 GeV
η^ℓ	$|\eta^e| < 2.47$ (excluding $1.37 < |\eta^e| < 1.52$), $|\eta^\mu| < 2.5$
Lepton identification	*TightLH* (electron), *Medium* (muon)
Lepton isolation	*Gradient* working point
Number of additional leptons ($p_T > 10$ GeV)	0
Number of jets (p_T >35 GeV, $|\eta|$ <4.5)	0
Number of b-tagged jets ($p_T > 20$ GeV, $|\eta|$ <2.5)	0
$E_T^{miss,track}$	> 20 GeV
$p_T^{e\mu}$	> 30 GeV
$m_{e\mu}$	> 55 GeV

Quantity	Sequential Cut DF	Sequential Cut SF	Random Forest DF	Random Forest SF
Number of leptons	Strictly 2		Strictly 2	
Lepton charges	Opposite		Opposite	
$p_T^{\ell\,max}$	>25		>25	
$p_T^{\ell\,min}$	>20		>20	
$m_{\ell\ell}$	>20	>40	>30	>30
Additional leptons	0		0	
$|m_{\ell\ell} - m_Z|$	—	>15	—	>15
$p_T^{\ell\ell}$	>30	>30	—	—
p_T^{miss}	>20	>55	—	—
$p_T^{miss,proj}$, $p_T^{miss,track\,proj}$	>20	>20	—	—
Number of jets	≤1		—	—
Number of b-tagged jets	0		0	
DYMVA score	—	>0.9	—	—
Drell-Yan RF score S_{DY}	—	—	—	>0.96
t$\bar{t}$ RF score $S_{t\bar{t}}$	—	—	—	>0.6

WW cross sections: Common phase space and bins

> **Additional information available for both experiments: common phase space**

> **Based on discussion in LHC-EWWG MB in Feb. 2017 (and followed up)**
  - https://indico.cern.ch/event/607366/

> **Additional material somewhat "hidden"**
  - https://atlas.web.cern.ch/Atlas/GROUPS/PHYSICS/PAPERS/STDM-2017-24/#auxstuff
  - (→ CMS link to be added)

> The simplified phase space is defined by requiring exactly one electron and muon (pTℓ>25 GeV, |ηℓ|<2.5), no jets (pTjet>30 GeV, |ηjet|<4.5) and ETmiss>20 GeV.
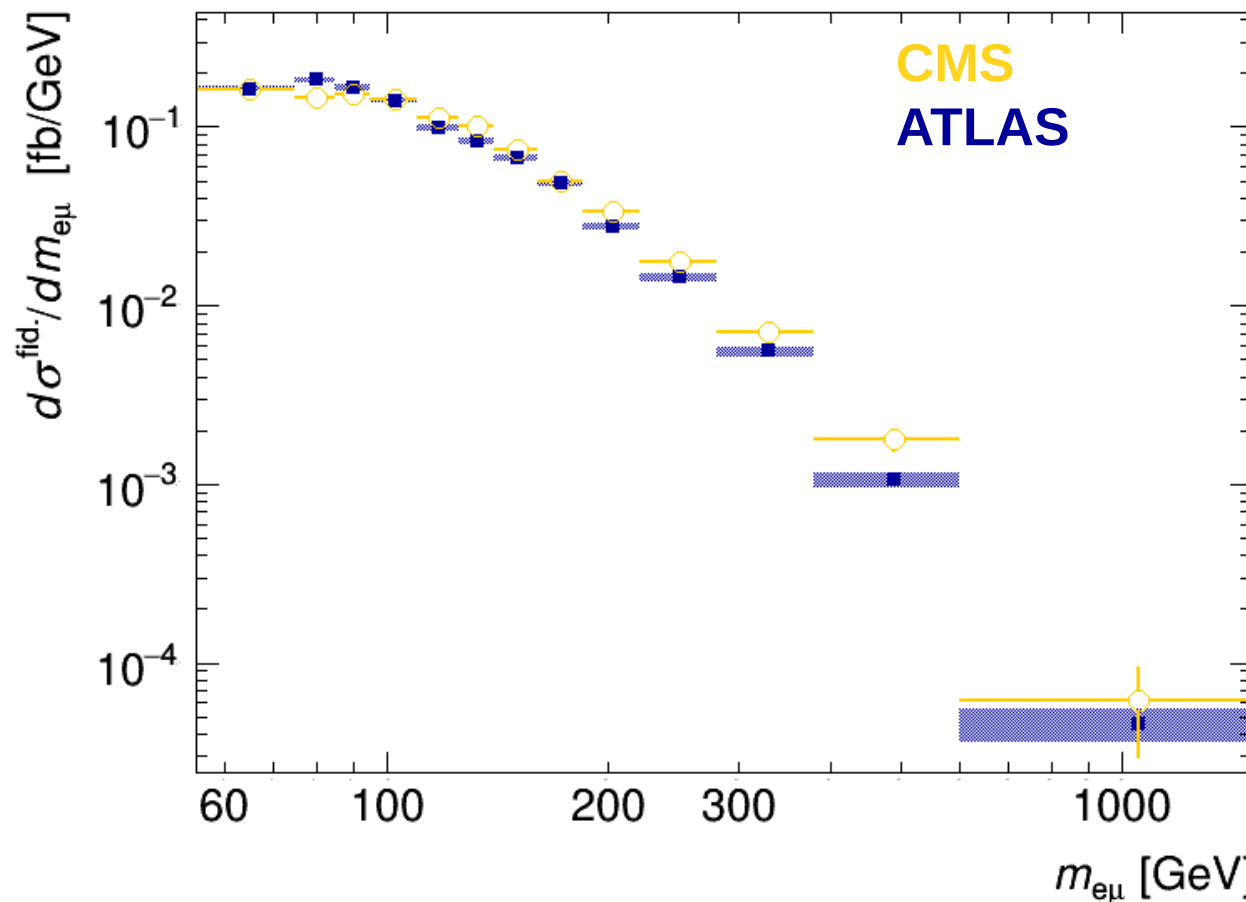
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LeadLepPT      { 27.,40.,50.,60.,70.,80,90,100.,110,130,150.,175,220,300,999.} )

Ptll          { 30.,35.,40.,45,50.,55,60.,65,70.,75,80.,90,105,140,200,999} )

Mll
 { 55.,75, 85,95.,110.,125,140.,160.,185,220,280.,380,600,1500.} )
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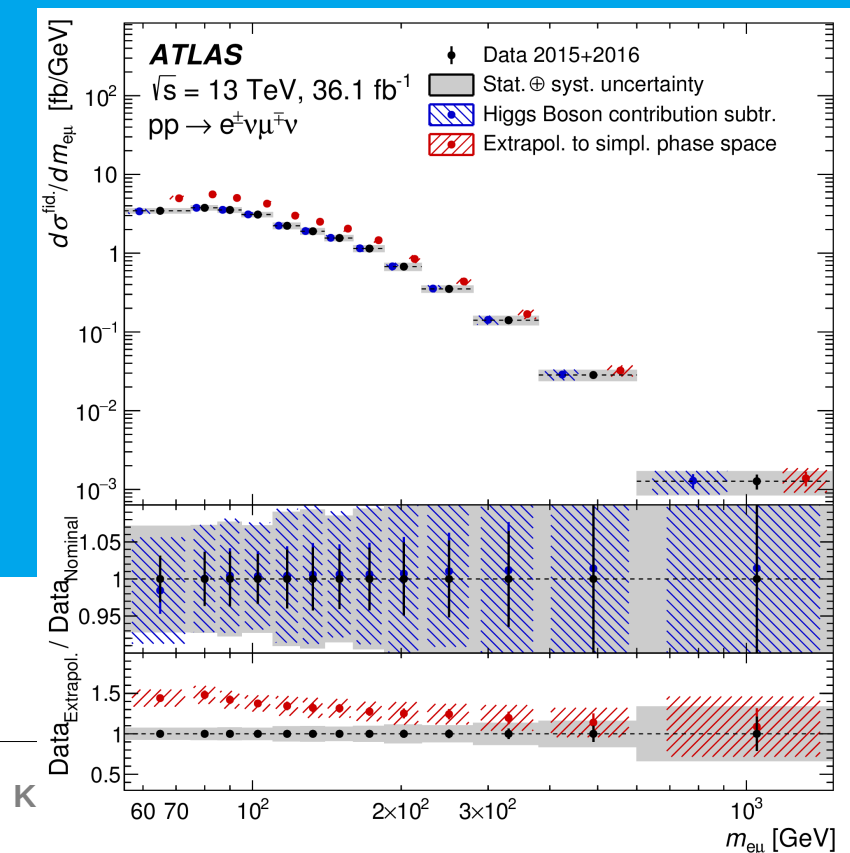
WW cross sections: Common phase space and bins

> **ATLAS data available from HEP data**
> **CMS data available on request**

> **Somewhat competible (ratio to be added, also for other distributions)**

Conclusions – where to go next

> Great to have finally some comparable measurements

> No "best" predictions for these distributions (→ yet?)

> Would be a great way
  to see where we stand

Backup slides.