



# Status of the ATLAS experiment

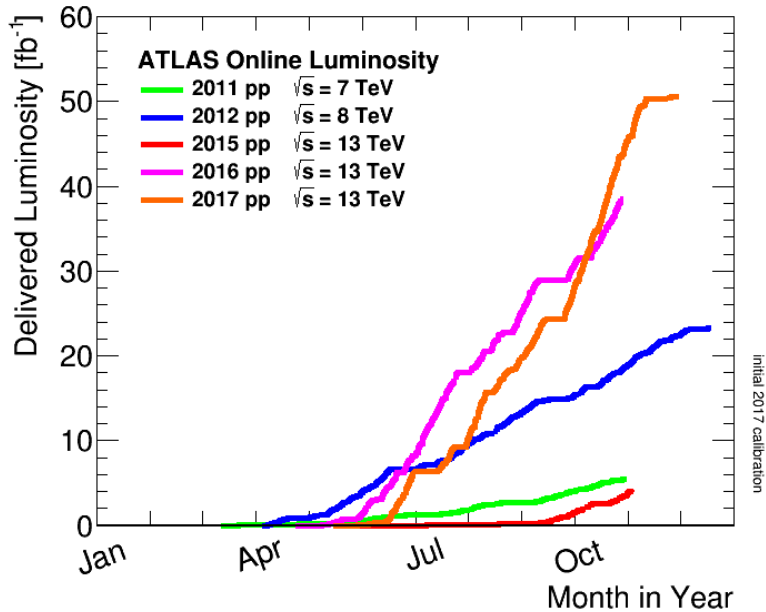
Малеев В.П.

Сессия Учёного совета ОФВЭ

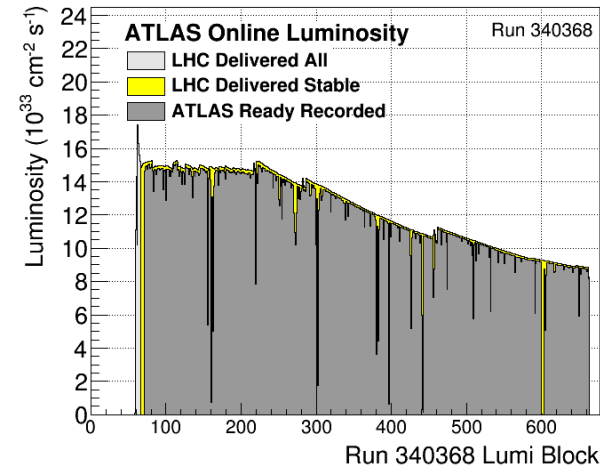
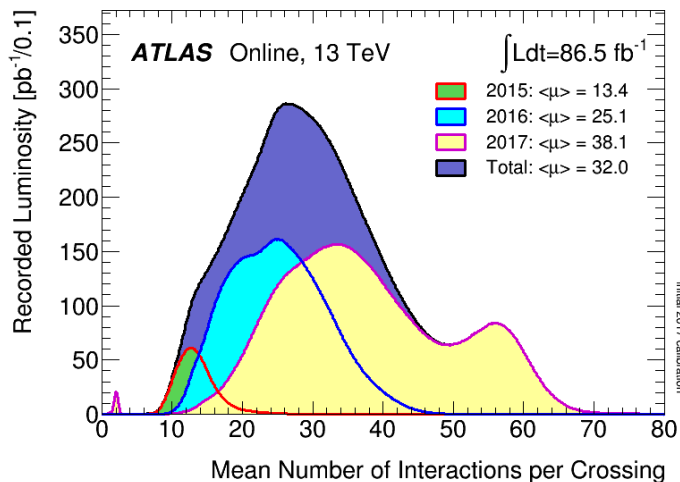
26.12.2017



# 2017 data

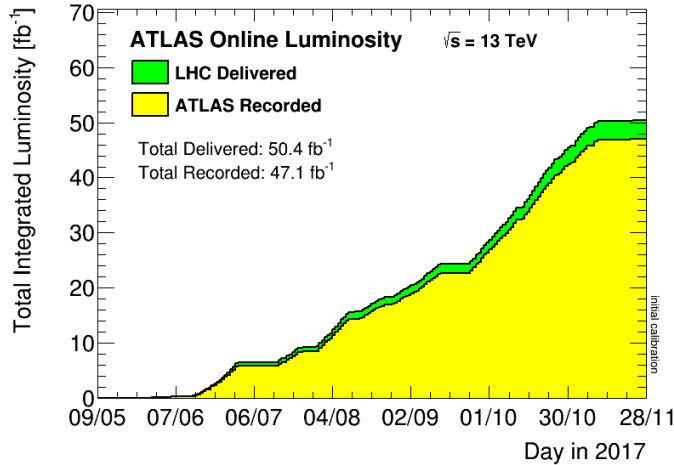


- Thanks LHC and accelerator team for  $50 \text{ fb}^{-1}$  of data
- Challenging conditions: Luminosity up to  $2 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$ ,  $\mu$  up to 80
- ATLAS requested levelling on 29<sup>th</sup> of September
- ATLAS can handle  $\mu \sim 60$  for trigger optimized for  $1.7 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$  and 80 kHz L1-rate (limitation are due to HL Trigger CPUs)



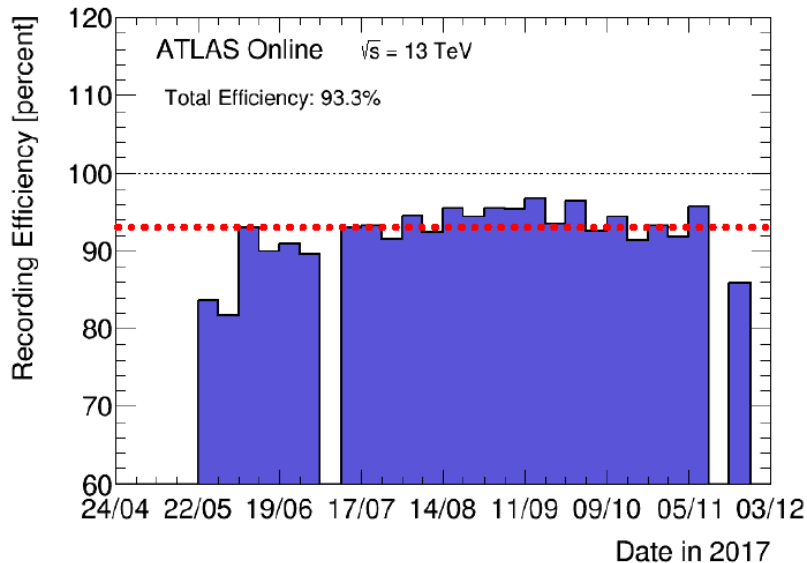


# Data taking



## Data taking efficiencies by subsystem

Pixel	SCT	TRT	LAr	Tile	MDT	CSC	RPC	TGC
97.8%	98.7%	97.2%	100%	99.9%	99.7%	96.1%	94.4%	99.5%



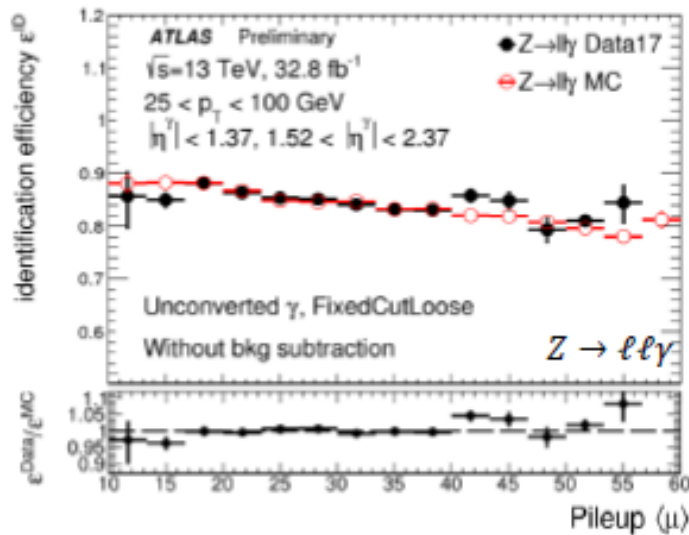
- ATLAS data taking efficiency 93.3%
- TRT data taking efficiency 97.2%
  - $\mu = 66$ : at 97 kHz L1 rate, TRT use ~92% of S-Link bandwidth
  - Expected improvement of ~10% by optimizing lossless data compression table with high data (former optimization with  $\mu = 40$  data)
  - More aggressive readout compression on the way to be ready to run at  $\mu = 80$



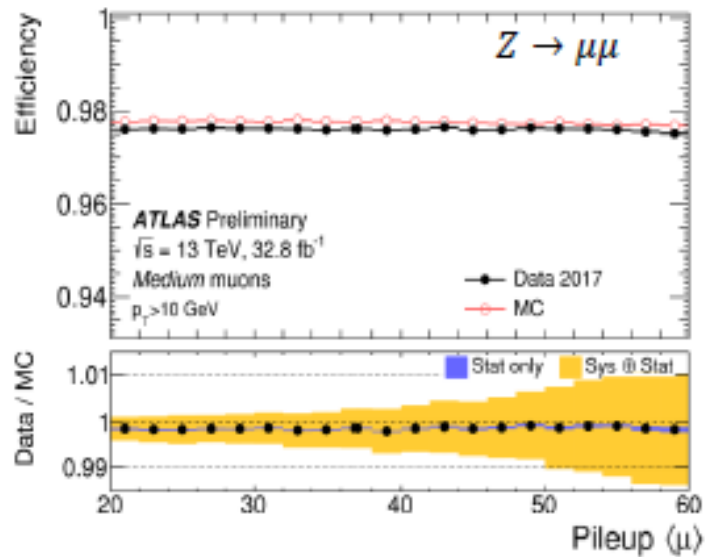
# Detector performance in 2017



## Photons

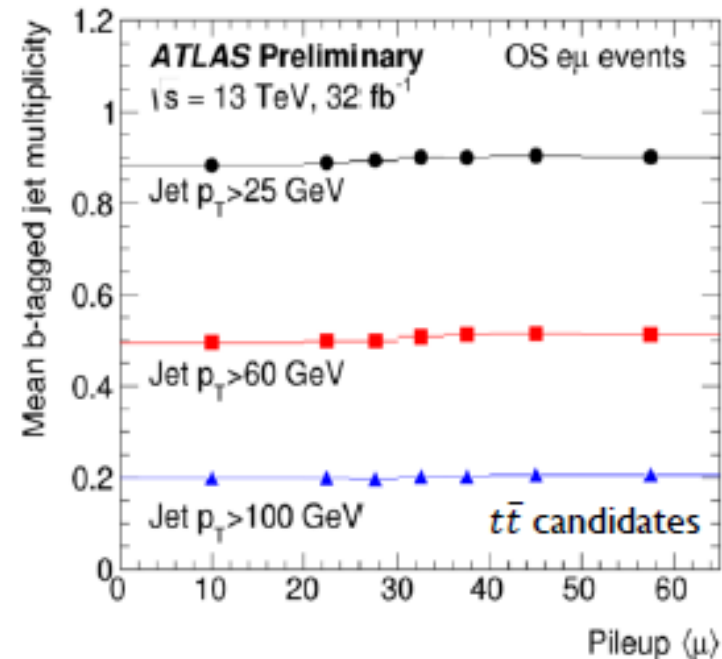


## Muons



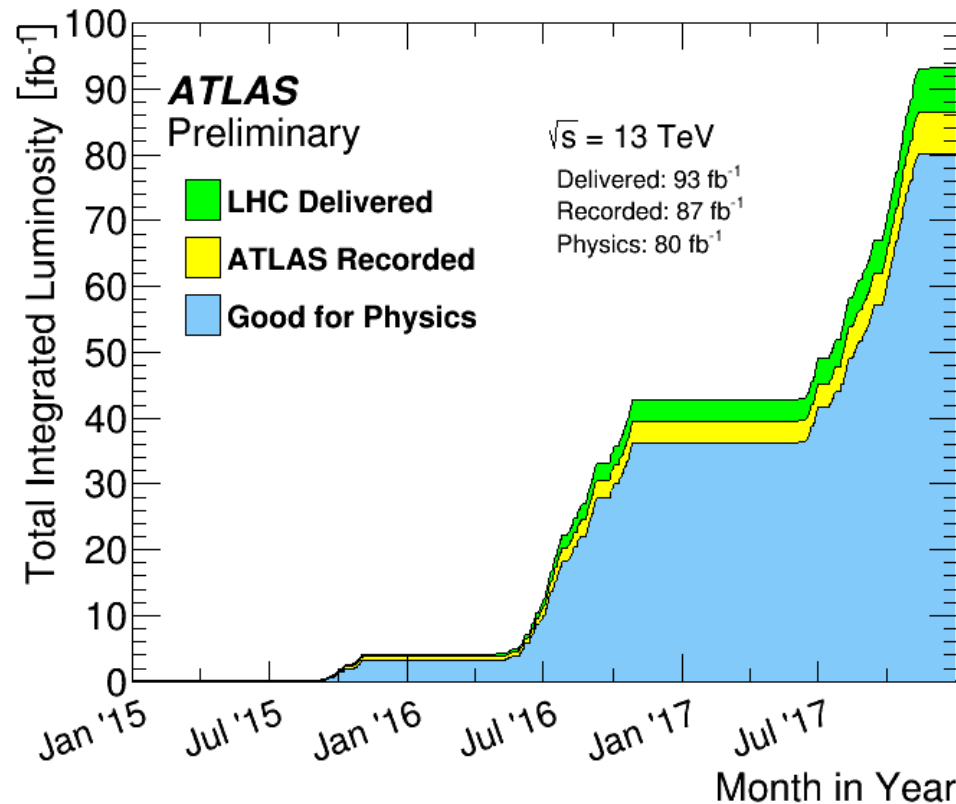
Detector shows stable identification ability in hard environment

## b-tagged jets





# Run II data



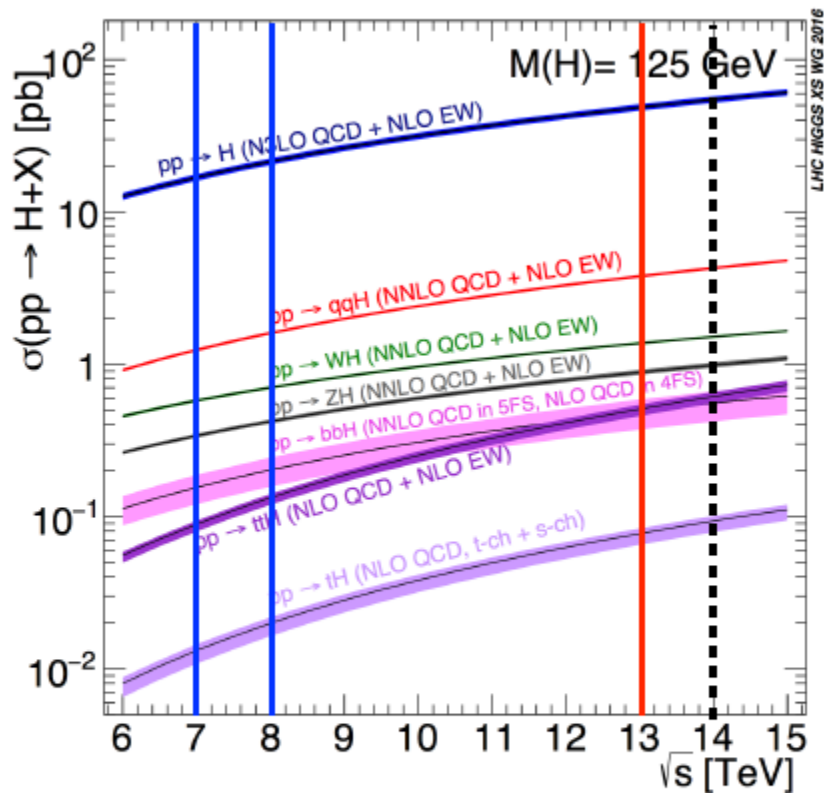
Good for Physics

- 2015-2016 data:  $36.1 \text{ fb}^{-1}$
- 2017 data  $43.9 \text{ fb}^{-1}$
- Run II  $80 \text{ fb}^{-1}$

Results presented below are based on 2015-2016 data mostly

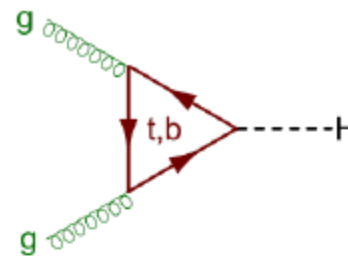


# Higgs production modes



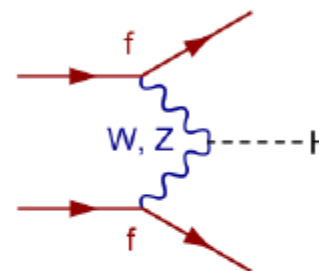
@ 13 TeV

ggF



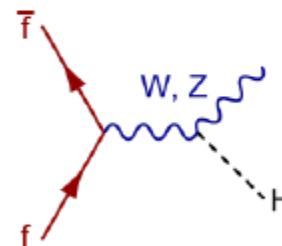
87%

VBF



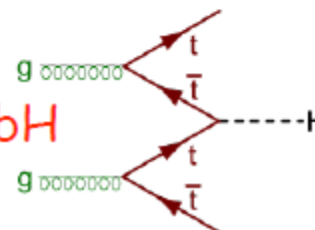
6.8%

VH



4.0%

ttH, bbH



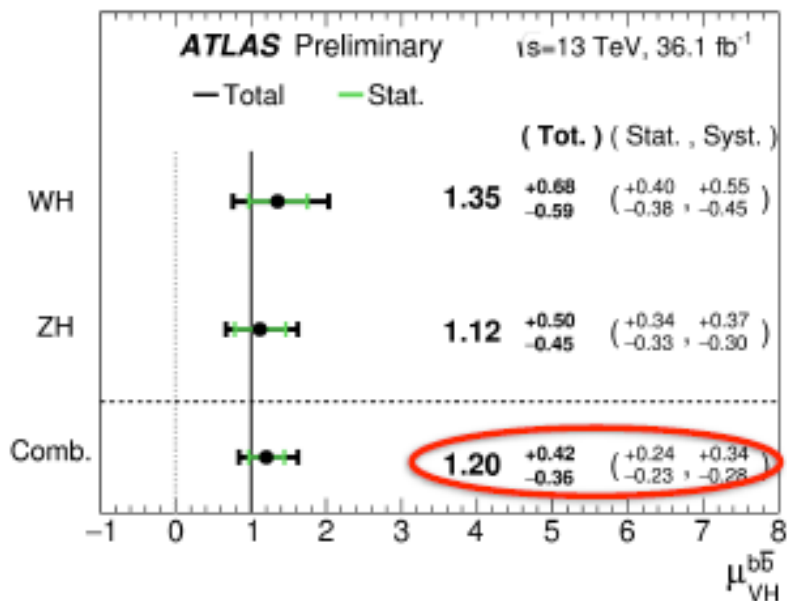
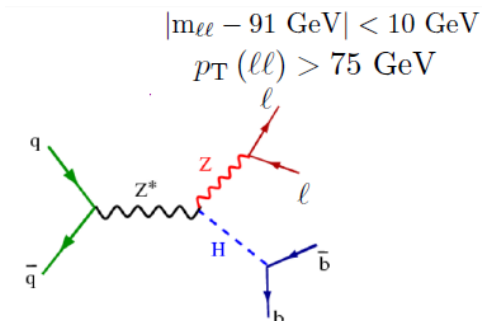
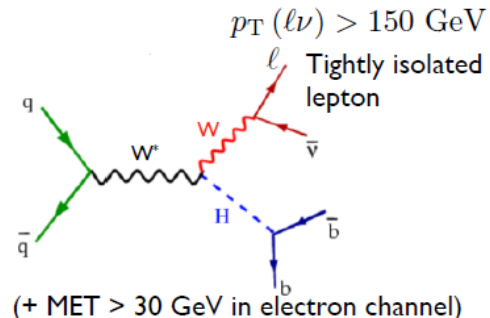
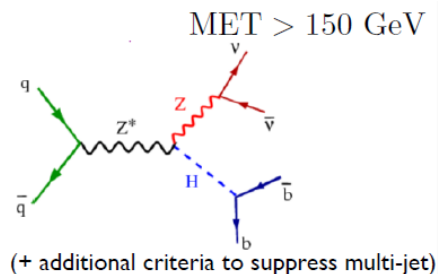
0.9% each



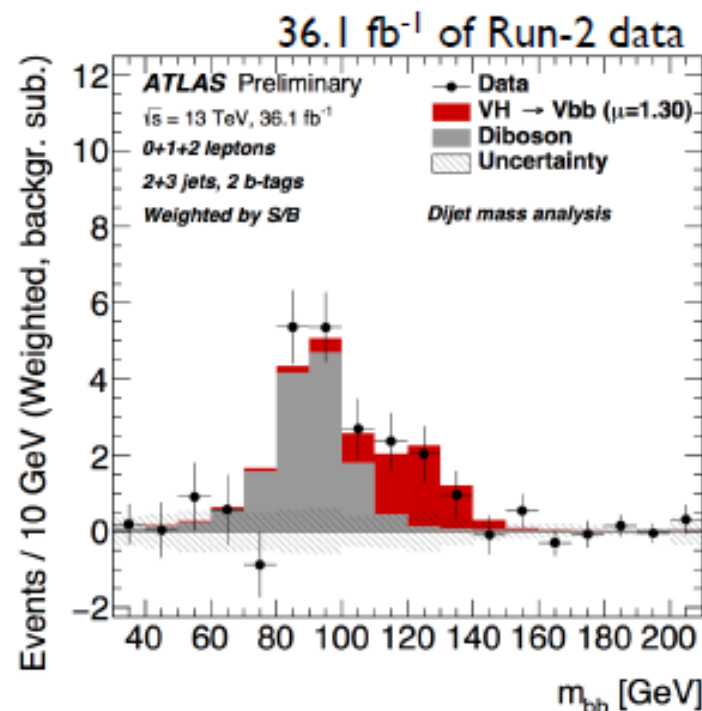
# Higgs physics



## Evidence of $H \rightarrow b\bar{b}$ (VH)



Significance:  
 **$3.5\sigma$**  observed  
 $3.0\sigma$  expected

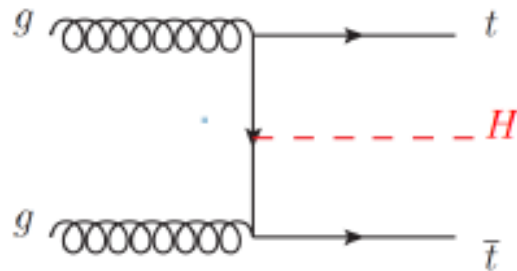




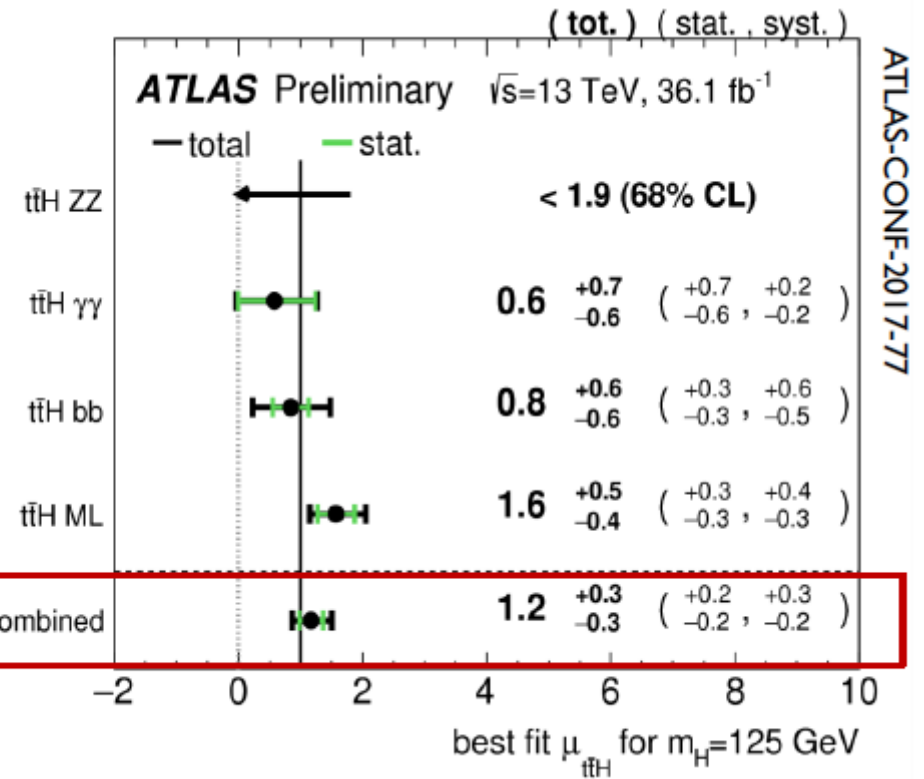
# $t\bar{t}H$



$t\bar{t}H$  is best direct way to measure  $\lambda_t$



Channel	Significance	
	Observed	Expected
Multilepton	$4.1\sigma$	$2.8\sigma$
$H \rightarrow b\bar{b}$	$1.4\sigma$	$1.6\sigma$
$H \rightarrow \gamma\gamma$	$0.9\sigma$	$1.7\sigma$
$H \rightarrow 4\ell$	—	$0.6\sigma$
<b>Combined</b>	<b><math>4.2\sigma</math></b>	<b><math>3.8\sigma</math></b>



**EVIDENCE** of  $t\bar{t}H$  production!

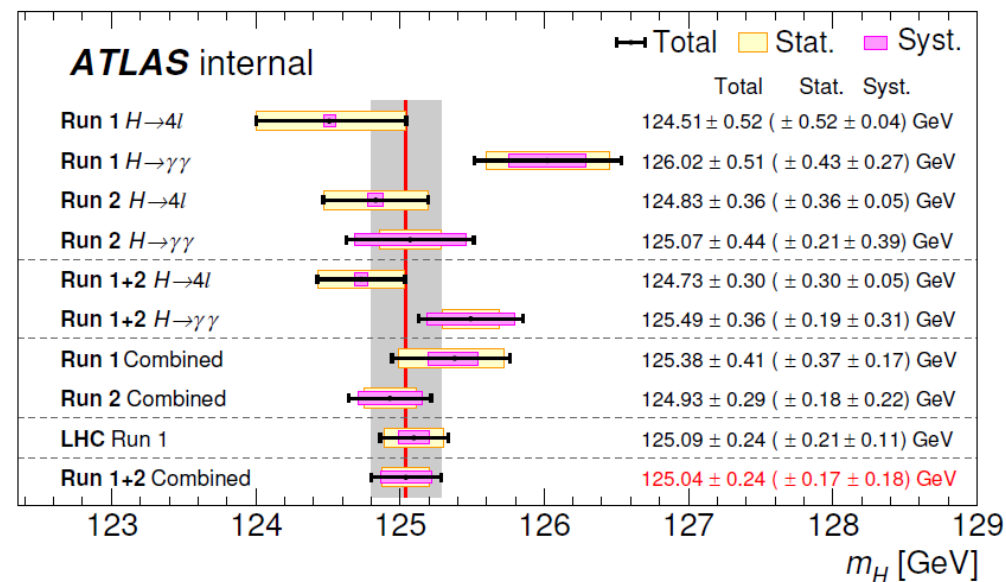
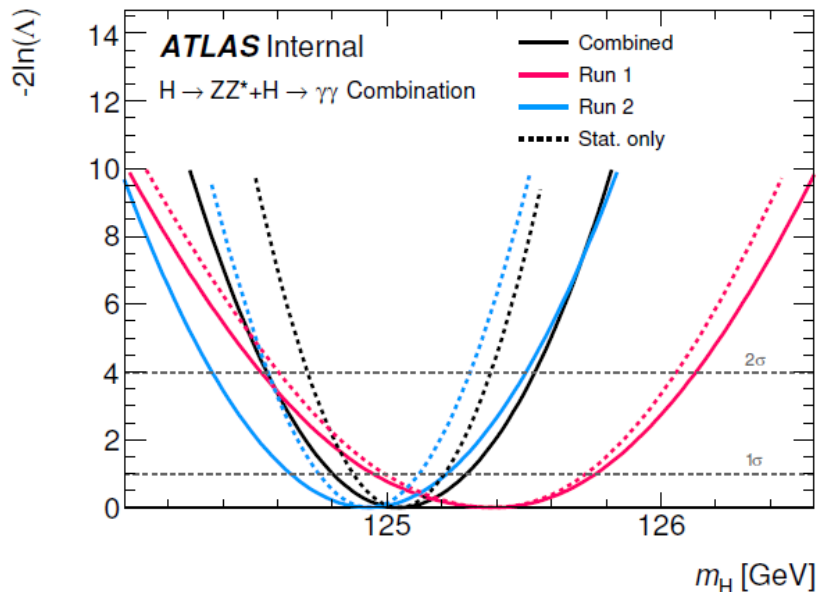




# Higgs mass



ATLAS-CONF-2017-046



2015-2016 data

$$m_H^{ZZ^*} = 124.84 \pm 0.36 \text{ (stat)} \pm 0.05 \text{ (syst)} \text{ GeV} = 124.84 \pm 0.36 \text{ GeV},$$

$$m_H^{\gamma\gamma} = 125.07 \pm 0.21 \text{ (stat)} \pm 0.39 \text{ (syst)} \text{ GeV} = 125.07 \pm 0.44 \text{ GeV}.$$

Run 2 combination

$$m_H = 124.93 \pm 0.18 \text{ (stat)} \pm 0.22 \text{ (syst)} \text{ GeV} = 124.93 \pm 0.29 \text{ GeV}.$$

Run 1 + Run 2 combination

$$m_H = 125.09 \pm 0.21 \text{ (stat)} \pm 0.11 \text{ (syst)} \text{ GeV} = 125.09 \pm 0.24 \text{ GeV}$$

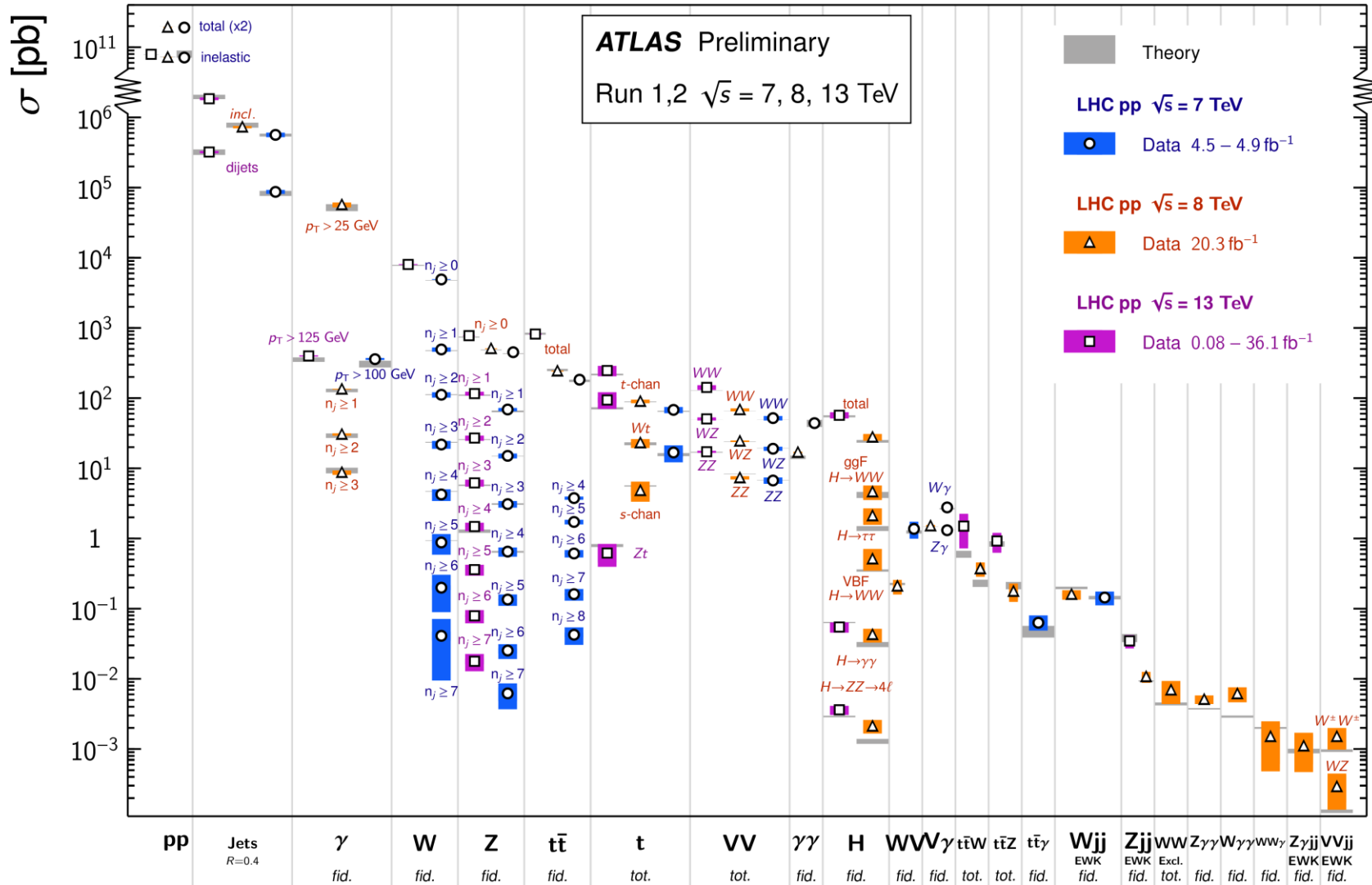


# SM Physics



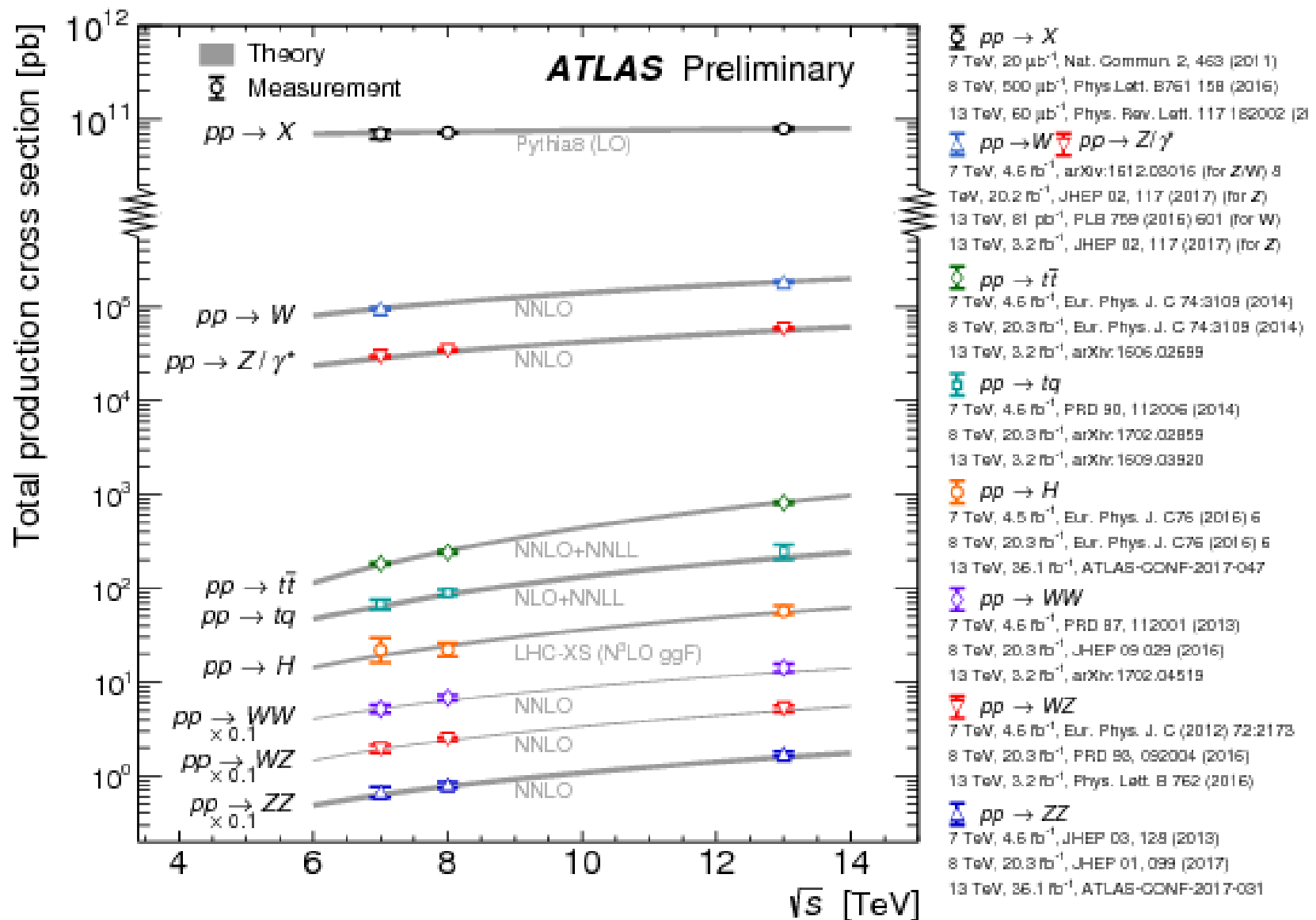
## Standard Model Production Cross Section Measurements

Status: July 2017





# SM physics

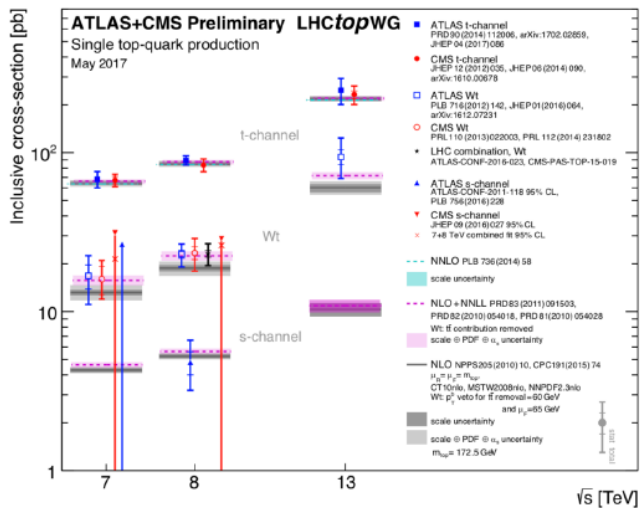
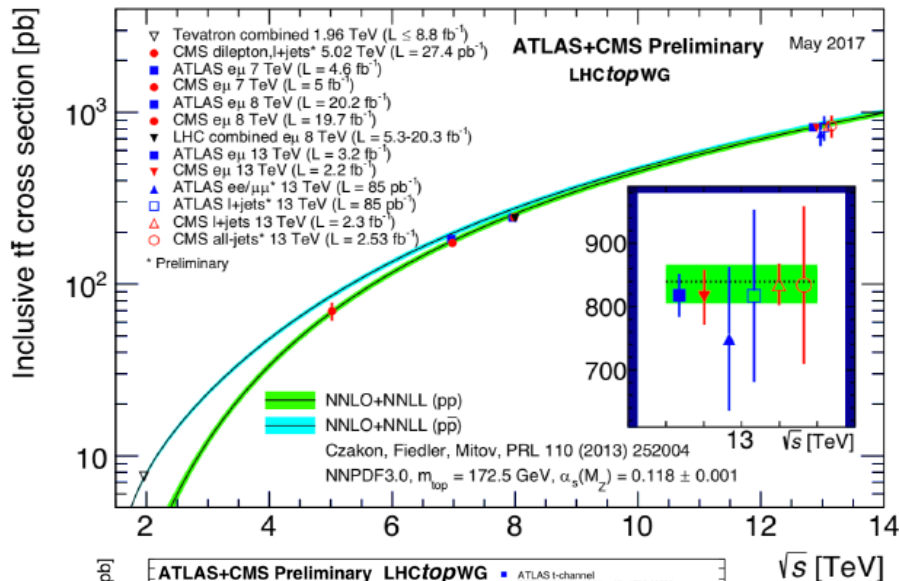




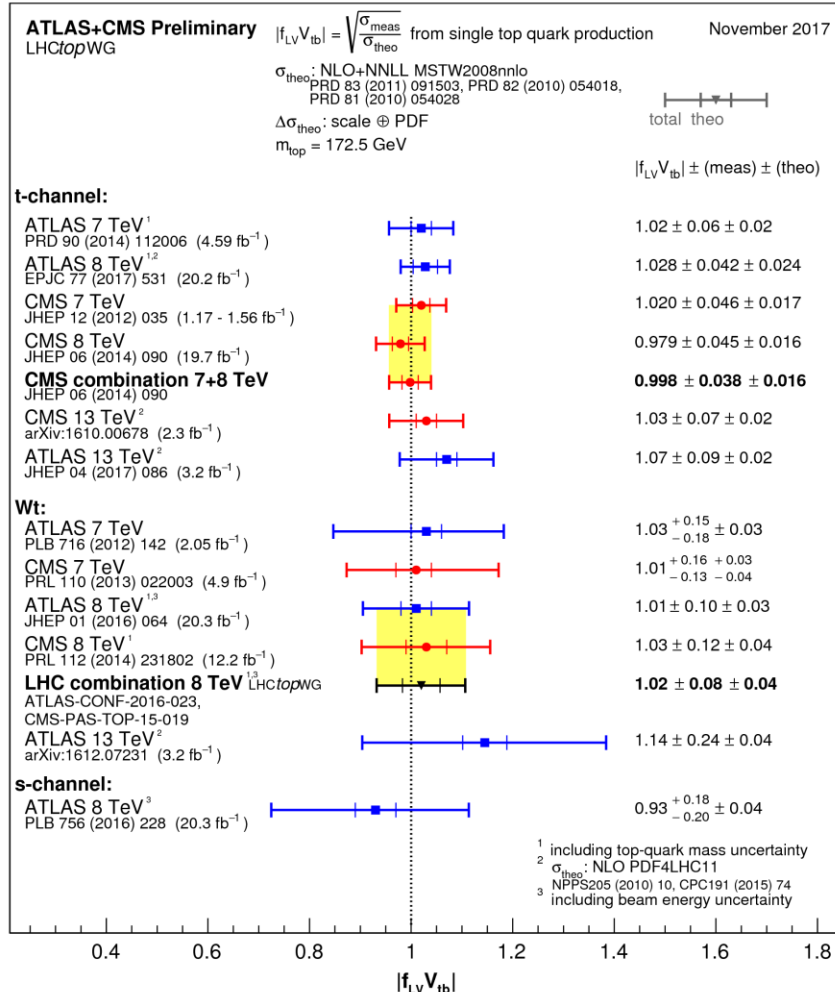
# t-quark physics



Summary plot, ATLAS in blue, CMS in Red



Cross-sections of single t-quark production for t-channel, Wt and s-channel



Cross-sections agrees with SM predictions,  $|V_{tb}|$  consistent with 1



# Exotics



## ATLAS Exotics Searches\* - 95% CL Upper Exclusion Limits

Status: July 2017

ATLAS Preliminary

$$\int \mathcal{L} dt = (3.2 - 37.0) \text{ fb}^{-1}$$

$$\sqrt{s} = 8, 13 \text{ TeV}$$

Model	$\ell, \gamma$	Jets <sup>†</sup>	$E_{\text{T}}^{\text{miss}}$	$\int \mathcal{L} dt [\text{fb}^{-1}]$	Limit	Reference	
Extra dimensions	ADD $G_{KK} + g/q$	$0 e, \mu$	$1-4 j$	Yes	36.1	$M_D$ 7.75 TeV	$n = 2$ ATLAS-CONF-2017-060
	ADD non-resonant $\gamma\gamma$	$2 \gamma$	-	-	36.7	$M_S$ 8.6 TeV	$n = 3$ HLZ NLO CERN-EP-2017-132
	ADD QBH	-	$2 j$	-	37.0	$M_{\text{bh}}$ 8.9 TeV	$n = 6$ 1703.09217
	ADD BH high $\Sigma p_T$	$\geq 1 e, \mu$	$\geq 2 j$	-	3.2	$M_{\text{bh}}$ 8.2 TeV	$n = 6, M_D = 3 \text{ TeV, rot BH}$ 1606.02265
	ADD BH multijet	-	$\geq 3 j$	-	3.6	$M_{\text{bh}}$ 9.55 TeV	$n = 6, M_D = 3 \text{ TeV, rot BH}$ 1512.02586
	RS1 $G_{KK} \rightarrow \gamma\gamma$	$2 \gamma$	-	-	36.7	$G_{KK} \text{ mass}$ 4.1 TeV	$k/M_{\text{Pl}} = 0.1$ CERN-EP-2017-132
	Bulk RS $G_{KK} \rightarrow WW \rightarrow qq\ell\nu$	$1 e, \mu$	$1 j$	Yes	36.1	$G_{KK} \text{ mass}$ 1.75 TeV	$k/M_{\text{Pl}} = 1.0$ ATLAS-CONF-2017-051
2UED / RPP	$1 e, \mu$	$\geq 2 b, \geq 3 j$	Yes	13.2	KK mass 1.6 TeV	Tier (1,1), $\mathcal{B}(A^{(1,1)} \rightarrow t\bar{t}) = 1$ ATLAS-CONF-2016-104	
Gauge bosons	SSM $Z' \rightarrow \ell\ell$	$2 e, \mu$	-	-	36.1	$Z' \text{ mass}$ 4.5 TeV	ATLAS-CONF-2017-027
	SSM $Z' \rightarrow \tau\tau$	$2 \tau$	-	-	36.1	$Z' \text{ mass}$ 2.4 TeV	ATLAS-CONF-2017-050
	Leptophobic $Z' \rightarrow bb$	-	$2 b$	-	3.2	$Z' \text{ mass}$ 1.5 TeV	1603.08791
	Leptophobic $Z' \rightarrow tt$	$1 e, \mu$	$\geq 1 b, \geq 1 J/2j$	Yes	3.2	$Z' \text{ mass}$ 2.0 TeV	$\Gamma/m = 3\%$ ATLAS-CONF-2016-014
	SSM $W' \rightarrow \ell\nu$	$1 e, \mu$	-	Yes	36.1	$W' \text{ mass}$ 5.1 TeV	1706.04786
	HVT $V' \rightarrow WW \rightarrow qq\ell\ell$ model B	$0 e, \mu$	$2 j$	-	36.7	$V' \text{ mass}$ 3.5 TeV	$g_V = 3$ CERN-EP-2017-147
	HVT $V' \rightarrow WH/ZH$ model B	multi-channel	-	-	36.1	$V' \text{ mass}$ 2.93 TeV	$g_V = 3$ ATLAS-CONF-2017-055
LRSM $W'_R \rightarrow tb$	$1 e, \mu$	$2 b, 0-1 j$	Yes	20.3	$W' \text{ mass}$ 1.92 TeV	1410.4103	
LRSM $W'_R \rightarrow tb$	$0 e, \mu$	$\geq 1 b, 1 j$	-	20.3	$W' \text{ mass}$ 1.76 TeV	1408.0886	
CI	CI $qqqq$	-	$2 j$	-	37.0	$\Lambda$ 21.8 TeV	$\eta_{LL}$ 1703.09217
	CI $\ell\ell qq$	$2 e, \mu$	-	-	36.1	$\Lambda$ 40.1 TeV	$\eta_{LL}$ ATLAS-CONF-2017-027
	CI $uu\ell\ell$	$2(SS)/\geq 3 e, \mu$	$\geq 1 b, \geq 1 j$	Yes	20.3	$\Lambda$ 4.9 TeV	$ C_{RR}  = 1$ 1504.04605
DM	Axial-vector mediator (Dirac DM)	$0 e, \mu$	$1-4 j$	Yes	36.1	$m_{\text{med}}$ 1.5 TeV	$g_a=0.25, g_v=1.0, m(\chi) < 400 \text{ GeV}$ ATLAS-CONF-2017-060
	Vector mediator (Dirac DM)	$0 e, \mu, 1 \gamma$	$\leq 1 j$	Yes	36.1	$m_{\text{med}}$ 1.2 TeV	$g_a=0.25, g_v=1.0, m(\chi) < 480 \text{ GeV}$ 1704.03848
	VV $\chi\chi$ EFT (Dirac DM)	$0 e, \mu$	$1 j, \leq 1 j$	Yes	3.2	$M_s$ 700 GeV	$m(\chi) < 150 \text{ GeV}$ 1608.02372
LQ	Scalar LQ 1 <sup>st</sup> gen	$2 e$	$\geq 2 j$	-	3.2	LQ mass 1.1 TeV	$\beta = 1$ 1605.06035
	Scalar LQ 2 <sup>nd</sup> gen	$2 \mu$	$\geq 2 j$	-	3.2	LQ mass 1.05 TeV	$\beta = 1$ 1605.06035
	Scalar LQ 3 <sup>rd</sup> gen	$1 e, \mu$	$\geq 1 b, \geq 3 j$	Yes	20.3	LQ mass 640 GeV	$\beta = 0$ 1508.04735
Heavy quarks	VLQ $TT \rightarrow Ht + X$	$0 \text{ or } 1 e, \mu$	$\geq 2 b, \geq 3 j$	Yes	13.2	T mass 1.2 TeV	$\mathcal{B}(T \rightarrow Ht) = 1$ ATLAS-CONF-2016-104
	VLQ $TT \rightarrow Zt + X$	$1 e, \mu$	$\geq 1 b, \geq 3 j$	Yes	36.1	T mass 1.16 TeV	$\mathcal{B}(T \rightarrow Zt) = 1$ 1705.10751
	VLQ $TT \rightarrow Wb + X$	$1 e, \mu$	$\geq 1 b, \geq 1 J/2j$	Yes	36.1	T mass 1.35 TeV	$\mathcal{B}(T \rightarrow Wb) = 1$ CERN-EP-2017-094
	VLQ $BB \rightarrow Hb + X$	$1 e, \mu$	$\geq 2 b, \geq 3 j$	Yes	20.3	B mass 700 GeV	$\mathcal{B}(B \rightarrow Hb) = 1$ 1505.04306
	VLQ $BB \rightarrow Zb + X$	$2/\geq 3 e, \mu$	$\geq 2/\geq 1 b$	-	20.3	B mass 790 GeV	$\mathcal{B}(B \rightarrow Zb) = 1$ 1409.5500
	VLQ $BB \rightarrow Wt + X$	$1 e, \mu$	$\geq 1 b, \geq 1 J/2j$	Yes	36.1	B mass 1.25 TeV	$\mathcal{B}(B \rightarrow Wt) = 1$ CERN-EP-2017-094
	VLQ $QQ \rightarrow WqWq$	$1 e, \mu$	$\geq 4 j$	Yes	20.3	Q mass 690 GeV	1509.04261
Excited fermions	Excited quark $q^* \rightarrow qg$	-	$2 j$	-	37.0	$q^* \text{ mass}$ 6.0 TeV	only $u^*$ and $d^*$ , $\Lambda = m(q^*)$ 1703.09127
	Excited quark $q^* \rightarrow q\gamma$	$1 \gamma$	$1 j$	-	36.7	$q^* \text{ mass}$ 5.3 TeV	only $u^*$ and $d^*$ , $\Lambda = m(q^*)$ CERN-EP-2017-148
	Excited quark $b^* \rightarrow bg$	-	$1 b, 1 j$	-	13.3	$b^* \text{ mass}$ 2.3 TeV	ATLAS-CONF-2016-060
	Excited quark $b^* \rightarrow Wt$	$1 \text{ or } 2 e, \mu$	$1 b, 2-0 j$	Yes	20.3	$b^* \text{ mass}$ 1.5 TeV	$f_g = f_t = f_b = 1$ 1510.02664
	Excited lepton $\ell^*$	$3 e, \mu$	-	-	20.3	$\ell^* \text{ mass}$ 3.0 TeV	$\Lambda = 3.0 \text{ TeV}$ 1411.2921
	Excited lepton $\nu^*$	$3 e, \mu, \tau$	-	-	20.3	$\nu^* \text{ mass}$ 1.6 TeV	$\Lambda = 1.6 \text{ TeV}$ 1411.2921
Other	LRSM Majorana $\nu$	$2 e, \mu$	$2 j$	-	20.3	$N^0 \text{ mass}$ 2.0 TeV	$m(W_R) = 2.4 \text{ TeV, no mixing}$ 1506.06020
	Higgs triplet $H^{\pm\pm} \rightarrow \ell\ell$	$2, 3, 4 e, \mu$ (SS)	-	-	36.1	$H^{\pm\pm} \text{ mass}$ 870 GeV	DY production ATLAS-CONF-2016-053
	Higgs triplet $H^{\pm\pm} \rightarrow \ell\tau$	$3 e, \mu, \tau$	-	-	20.3	$H^{\pm\pm} \text{ mass}$ 400 GeV	DY production, $\mathcal{B}(H^{\pm\pm} \rightarrow \ell\tau) = 1$ 1411.2921
	Monotop (non-res prod)	$1 e, \mu$	$1 b$	Yes	20.3	spin-1 invisible particle mass 657 GeV	$\mathcal{B}_{\text{non-res}} = 0.2$ 1410.5404
	Multi-charged particles	-	-	-	20.3	multi-charged particle mass 785 GeV	DY production, $ q  = 5e$ 1504.04188
	Magnetic monopoles	-	-	-	7.0	monopole mass 1.34 TeV	DY production, $ g  = 1g_D, \text{spin } 1/2$ 1509.08059

$\sqrt{s} = 8 \text{ TeV}$     $\sqrt{s} = 13 \text{ TeV}$

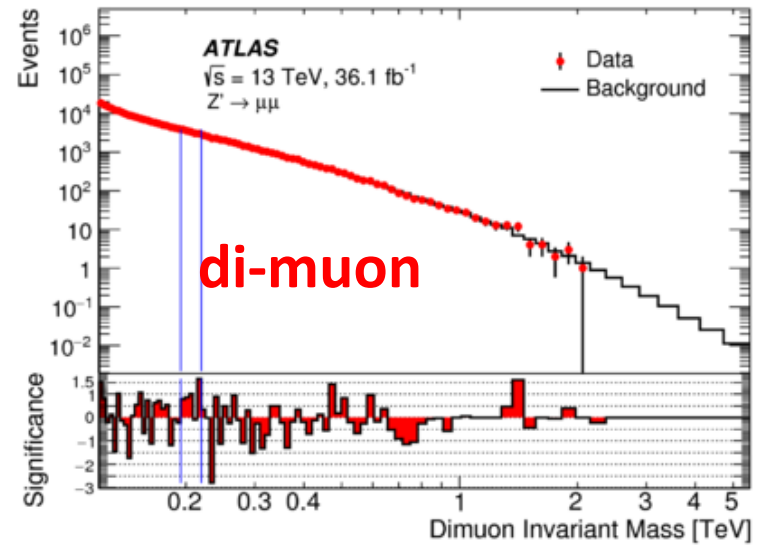
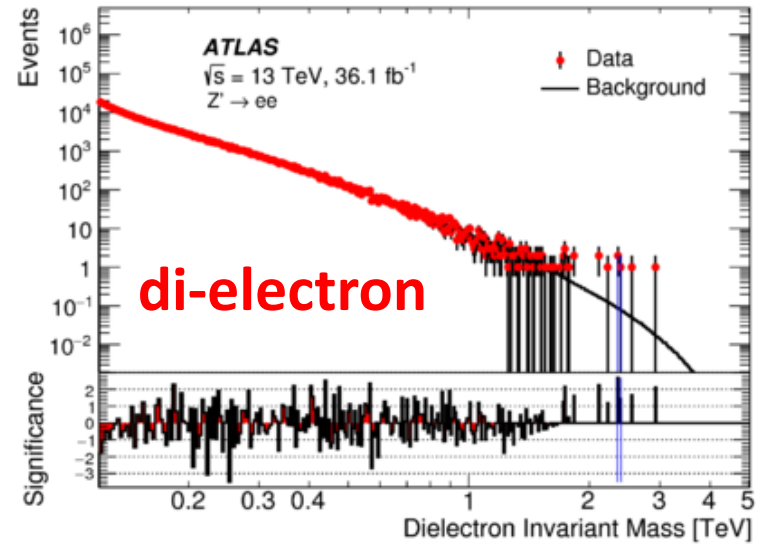
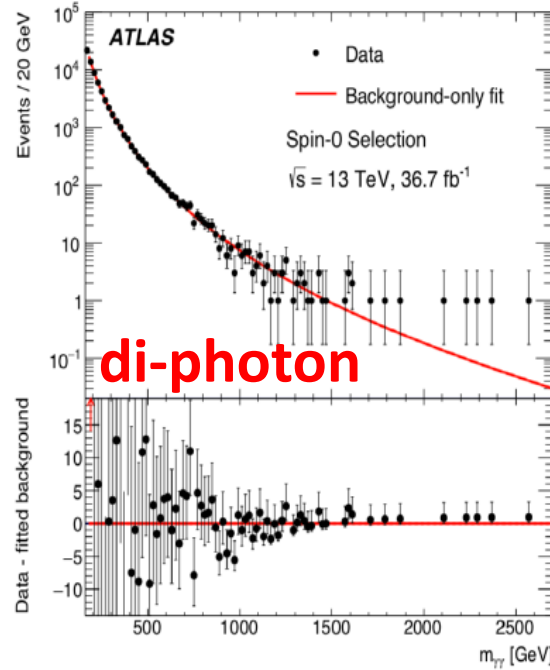
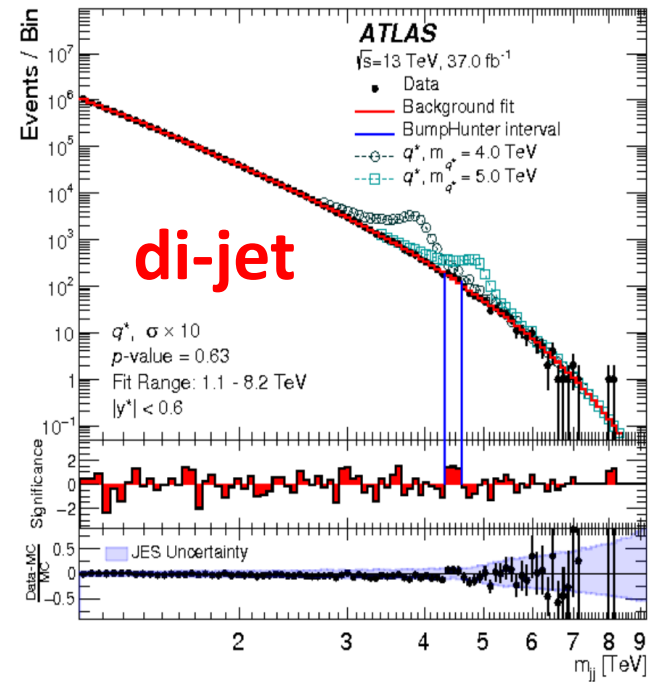
\*Only a selection of the available mass limits on new states or phenomena is shown.

<sup>†</sup>Small-radius (large-radius) jets are denoted by the letter j (J).

These and more results on <https://twiki.cern.ch/twiki/bin/view/AtlasPublic/ExoticsPublicResults>



# High-mass resonances



No data excess observed ☹️



# SUSY



## ATLAS SUSY Searches\* - 95% CL Lower Limits

December 2017

ATLAS Preliminary

$\sqrt{s} = 7, 8, 13 \text{ TeV}$

Model	$e, \mu, \tau, \gamma$	Jets	$E_T^{\text{miss}}$	$\int \mathcal{L} dt (\text{fb}^{-1})$	Mass limit	Reference			
						$\sqrt{s} = 7, 8 \text{ TeV}$	$\sqrt{s} = 13 \text{ TeV}$		
Inclusive Searches	$\tilde{q}\tilde{q}, \tilde{q} \rightarrow q\tilde{\chi}_1^0$ (compressed)	0	2-6 jets	Yes	36.1	$\tilde{q}$	1.57 TeV	$m(\tilde{\chi}_1^0) < 200 \text{ GeV}, m(1^{\text{st}} \text{ gen. } \tilde{q}) = m(2^{\text{nd}} \text{ gen. } \tilde{q})$	1712.02332
		mono-jet	1-3 jets	Yes	36.1	$\tilde{q}$	710 GeV	$m(\tilde{q}) - m(\tilde{\chi}_1^0) < 5 \text{ GeV}$	1711.03301
		0	2-6 jets	Yes	36.1	$\tilde{g}$	2.02 TeV	$m(\tilde{\chi}_1^0) < 200 \text{ GeV}$	1712.02332
		0	2-6 jets	Yes	36.1	$\tilde{g}$	2.01 TeV	$m(\tilde{\chi}_1^0) < 200 \text{ GeV}, m(\tilde{\chi}_2^0) = 0.5(m(\tilde{\chi}_1^0) + m(\tilde{g}))$	1712.02332
		$ee, \mu\mu$	2 jets	Yes	14.7	$\tilde{g}$	1.7 TeV	$m(\tilde{\chi}_1^0) < 300 \text{ GeV}$	1611.05791
		$3 e, \mu$	4 jets	-	36.1	$\tilde{g}$	1.87 TeV	$m(\tilde{\chi}_1^0) = 0 \text{ GeV}$	1706.03731
		0	7-11 jets	Yes	36.1	$\tilde{g}$	1.8 TeV	$m(\tilde{\chi}_1^0) < 400 \text{ GeV}$	1708.02794
		1-2 $\tau$ + 0-1 $\ell$	0-2 jets	Yes	3.2	$\tilde{g}$	2.0 TeV		1607.05979
		2 $\gamma$	-	Yes	36.1	$\tilde{g}$	2.15 TeV	$c\tau(\text{NLSP}) < 0.1 \text{ mm}$	ATLAS-CONF-2017-080
		2 jets	Yes	36.1	$\tilde{g}$	2.05 TeV	$m(\tilde{\chi}_1^0) = 1700 \text{ GeV}, c\tau(\text{NLSP}) < 0.1 \text{ mm}, \mu > 0$	ATLAS-CONF-2017-080	
0	mono-jet	Yes	20.3	$F^{1/2}$ scale	865 GeV	$m(\tilde{G}) > 1.8 \times 10^{-4} \text{ eV}, m(\tilde{g}) = m(\tilde{q}) = 1.5 \text{ TeV}$	1502.01518		
$2^{\text{nd}}$ gen. $\tilde{g}, \text{ med.}$	0	3 b	Yes	36.1	$\tilde{g}$	1.92 TeV	$m(\tilde{\chi}_1^0) < 600 \text{ GeV}$	1711.01901	
	0-1 $e, \mu$	3 b	Yes	36.1	$\tilde{g}$	1.97 TeV	$m(\tilde{\chi}_1^0) < 200 \text{ GeV}$	1711.01901	
$3^{\text{rd}}$ gen. squarks direct production	$\tilde{b}_1\tilde{b}_1, \tilde{b}_1 \rightarrow b\tilde{\chi}_1^0$	0	2 b	Yes	36.1	$\tilde{b}_1$	950 GeV	$m(\tilde{\chi}_1^0) < 420 \text{ GeV}$	1708.09266
	$\tilde{b}_1\tilde{b}_1, \tilde{b}_1 \rightarrow t\tilde{\chi}_1^0$	2 $e, \mu$ (SS)	1 b	Yes	36.1	$\tilde{b}_1$	275-700 GeV	$m(\tilde{\chi}_1^0) < 200 \text{ GeV}, m(\tilde{\chi}_2^0) = m(\tilde{\chi}_1^0) + 100 \text{ GeV}$	1706.03731
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1 \rightarrow b\tilde{\chi}_1^0$	2 $e, \mu$	1-2 b	Yes	4.7/13.3	$\tilde{t}_1$	117-170 GeV	$m(\tilde{\chi}_1^0) = 2m(\tilde{\chi}_2^0), m(\tilde{\chi}_2^0) = 55 \text{ GeV}$	1209.2102, ATLAS-CONF-2016-077
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1 \rightarrow Wb\tilde{\chi}_1^0$ or $t\tilde{\chi}_1^0$	0-2 $e, \mu$	0-2 jets/1-2 b	Yes	20.3/36.1	$\tilde{t}_1$	90-198 GeV	$m(\tilde{\chi}_1^0) = 1 \text{ GeV}$	1506.08616, 1709.04183, 1711.11520
	0	mono-jet	Yes	36.1	$\tilde{t}_1$	90-430 GeV	$m(\tilde{t}_1) - m(\tilde{\chi}_1^0) = 5 \text{ GeV}$	1711.03301	
	$\tilde{t}_1\tilde{t}_1$ (natural GMSB)	2 $e, \mu$ (Z)	1 b	Yes	20.3	$\tilde{t}_1$	150-600 GeV	$m(\tilde{\chi}_1^0) > 150 \text{ GeV}$	1403.5222
	$\tilde{t}_1\tilde{t}_1$ (natural GMSB)	3 $e, \mu$ (Z)	1 b	Yes	36.1	$\tilde{t}_2$	290-790 GeV	$m(\tilde{\chi}_1^0) = 0 \text{ GeV}$	1706.03986
$\tilde{t}_2\tilde{t}_2, \tilde{t}_2 \rightarrow \tilde{t}_1 + h$	1-2 $e, \mu$	4 b	Yes	36.1	$\tilde{t}_2$	320-880 GeV	$m(\tilde{\chi}_1^0) = 0 \text{ GeV}$	1706.03986	
EW direct	$\tilde{\ell}_{L,R}\tilde{\ell}_{L,R}, \tilde{\ell} \rightarrow \ell\tilde{\chi}_1^0$	2 $e, \mu$	0	Yes	36.1	$\tilde{\ell}$	90-500 GeV	$m(\tilde{\chi}_1^0) = 0$	ATLAS-CONF-2017-039
	$\tilde{\chi}_1^+\tilde{\chi}_1^-, \tilde{\chi}_1^+ \rightarrow \tilde{\nu}(\tilde{\nu})$	2 $e, \mu$	0	Yes	36.1	$\tilde{\chi}_1^+$	750 GeV	$m(\tilde{\chi}_1^0) = 0, m(\tilde{\ell}, \tilde{\nu}) = 0.5(m(\tilde{\chi}_1^+) + m(\tilde{\chi}_1^0))$	ATLAS-CONF-2017-039
	$\tilde{\chi}_1^+\tilde{\chi}_1^+, \tilde{\chi}_1^+ \rightarrow \tilde{\nu}(\tilde{\nu})$	2 $\tau$	-	Yes	36.1	$\tilde{\chi}_1^+$	760 GeV	$m(\tilde{\chi}_1^0) = 0, m(\tilde{\ell}, \tilde{\nu}) = 0.5(m(\tilde{\chi}_1^+) + m(\tilde{\chi}_1^0))$	1708.07875
	$\tilde{\chi}_1^+\tilde{\chi}_1^0 \rightarrow \tilde{\ell}_1, \tilde{\nu}_2(\tilde{\nu}_2), \tilde{\ell}\tilde{\nu}_1, \tilde{\ell}\tilde{\nu}_2$	3 $e, \mu$	0	Yes	36.1	$\tilde{\chi}_1^+, \tilde{\chi}_2^0$	1.13 TeV	$m(\tilde{\chi}_1^+) = m(\tilde{\chi}_2^0), m(\tilde{\chi}_2^0) = 0, m(\tilde{\ell}, \tilde{\nu}) = 0.5(m(\tilde{\chi}_1^+) + m(\tilde{\chi}_1^0))$	ATLAS-CONF-2017-039
	$\tilde{\chi}_1^+\tilde{\chi}_2^0 \rightarrow W\tilde{\chi}_1^0, Z\tilde{\chi}_1^0$	2-3 $e, \mu$	0-2 jets	Yes	36.1	$\tilde{\chi}_1^+, \tilde{\chi}_2^0$	580 GeV	$m(\tilde{\chi}_1^+) = m(\tilde{\chi}_2^0), m(\tilde{\chi}_2^0) = 0, \tilde{\ell}$ decoupled	ATLAS-CONF-2017-039
	$\tilde{\chi}_1^+\tilde{\chi}_2^0 \rightarrow W\tilde{\chi}_1^0, h\tilde{\chi}_1^0$	$e, \mu, \gamma$	0-2 b	Yes	20.3	$\tilde{\chi}_1^+, \tilde{\chi}_2^0$	270 GeV	$m(\tilde{\chi}_1^+) = m(\tilde{\chi}_2^0), m(\tilde{\chi}_2^0) = 0, \tilde{\ell}$ decoupled	1501.07110
	$\tilde{\chi}_2^+\tilde{\chi}_3^-, \tilde{\chi}_2^+ \rightarrow \tilde{\ell}_R\tilde{\ell}$	4 $e, \mu$	0	Yes	20.3	$\tilde{\chi}_2^+, \tilde{\chi}_3^-$	635 GeV	$m(\tilde{\chi}_2^+) = m(\tilde{\chi}_3^-), m(\tilde{\chi}_3^-) = 0, m(\tilde{\ell}, \tilde{\nu}) = 0.5(m(\tilde{\chi}_2^+) + m(\tilde{\chi}_1^0))$	1405.5086
	GGM (wino NLSP) weak prod., $\tilde{\chi}_1^0 \rightarrow \gamma\tilde{G}$	1 $e, \mu + \gamma$	-	Yes	20.3	$\tilde{W}$	115-370 GeV	$c\tau < 1 \text{ mm}$	1507.05493
	GGM (bino NLSP) weak prod., $\tilde{\chi}_1^0 \rightarrow \gamma\tilde{G}$	2 $\gamma$	-	Yes	36.1	$\tilde{W}$	1.06 TeV	$c\tau < 1 \text{ mm}$	ATLAS-CONF-2017-080
	Long-lived particles	Direct $\tilde{\chi}_1^+\tilde{\chi}_1^-$ prod., long-lived $\tilde{\chi}_1^+$	Disapp. trk	1 jet	Yes	36.1	$\tilde{\chi}_1^+$	460 GeV	$m(\tilde{\chi}_1^+) - m(\tilde{\chi}_1^0) = 160 \text{ MeV}, \tau(\tilde{\chi}_1^+) = 0.2 \text{ ns}$
Direct $\tilde{\chi}_1^+\tilde{\chi}_1^-$ prod., long-lived $\tilde{\chi}_1^+$		dE/dx trk	-	Yes	18.4	$\tilde{\chi}_1^+$	495 GeV	$m(\tilde{\chi}_1^+) - m(\tilde{\chi}_1^0) = 160 \text{ MeV}, \tau(\tilde{\chi}_1^+) < 15 \text{ ns}$	1506.05332
Stable, stopped $\tilde{g}$ R-hadron		0	1-5 jets	Yes	27.9	$\tilde{g}$	850 GeV	$m(\tilde{\chi}_1^0) = 100 \text{ GeV}, 10 \mu\text{s} < \tau(\tilde{g}) < 1000 \text{ s}$	1310.6584
Stable $\tilde{g}$ R-hadron		trk	-	-	3.2	$\tilde{g}$	1.58 TeV		1606.05129
Metastable $\tilde{g}$ R-hadron		dE/dx trk	-	-	3.2	$\tilde{g}$	1.57 TeV		1604.04520
Metastable $\tilde{g}$ R-hadron, $\tilde{g} \rightarrow q\tilde{q}\tilde{\chi}_1^0$		displ. vtx	-	Yes	32.8	$\tilde{g}$	2.37 TeV	$m(\tilde{\chi}_1^0) = 100 \text{ GeV}, \tau > 10 \text{ ns}$	1710.04901
GMSB, stable $\tilde{\tau}, \tilde{\chi}_1^+ \rightarrow \tilde{\tau}(\tilde{\tau}, \tilde{\mu}) + \tau(e, \mu)$		1-2 $\mu$	-	-	19.1	$\tilde{\chi}_1^0$	537 GeV	$\tau(\tilde{g}) = 0.17 \text{ ns}, m(\tilde{\chi}_1^0) = 100 \text{ GeV}$	1411.6795
GMSB, $\tilde{\chi}_1^0 \rightarrow \gamma\tilde{G}$ , long-lived $\tilde{\chi}_1^0$	2 $\gamma$	-	Yes	20.3	$\tilde{\chi}_1^0$	440 GeV	$1 - c\tau(\tilde{\chi}_1^0) < 3 \text{ ns}, \text{SPS8 model}$	1409.5542	
$\tilde{g}\tilde{g}, \tilde{\chi}_1^0 \rightarrow ee\nu/\mu\nu/\mu\nu$	displ. $ee/\mu\nu/\mu\nu$	-	-	20.3	$\tilde{\chi}_1^0$	1.0 TeV	$7 < c\tau(\tilde{\chi}_1^0) < 740 \text{ mm}, m(\tilde{g}) = 1.3 \text{ TeV}$	1504.05162	
RPV	LFV $pp \rightarrow \tilde{\nu}_\tau + X, \tilde{\nu}_\tau \rightarrow e\mu/\tau\mu$	$e\mu, \tau\mu$	-	-	3.2	$\tilde{\nu}_\tau$	1.9 TeV	$\lambda'_{311} = 0.11, \lambda'_{322}/\lambda'_{333}/\lambda'_{333} = 0.07$	1607.08079
	Bitilinear RPV CMSSM	2 $e, \mu$ (SS)	0-3 b	Yes	20.3	$\tilde{q}, \tilde{g}$	1.45 TeV	$m(\tilde{q}) = m(\tilde{g}), c\tau_{LSF} < 1 \text{ mm}$	1404.2500
	$\tilde{\chi}_1^+\tilde{\chi}_1^-, \tilde{\chi}_1^+ \rightarrow W\tilde{\chi}_1^0, \tilde{\chi}_1^+ \rightarrow ee\nu, e\mu\nu, \mu\nu$	4 $e, \mu$	-	Yes	13.3	$\tilde{\chi}_1^+$	1.14 TeV	$m(\tilde{\chi}_1^+) > 400 \text{ GeV}, \lambda'_{124} \neq 0 (\lambda'_{124} = 1, 2)$	ATLAS-CONF-2016-075
	$\tilde{\chi}_1^+\tilde{\chi}_1^-, \tilde{\chi}_1^+ \rightarrow W\tilde{\chi}_1^0, \tilde{\chi}_1^+ \rightarrow \tau\nu_{\tau e}, e\nu_{\tau e}$	3 $e, \mu + \tau$	-	Yes	20.3	$\tilde{\chi}_1^+$	450 GeV	$m(\tilde{\chi}_1^+) > 0.2 \times m(\tilde{\chi}_1^0), \lambda'_{133} \neq 0$	1405.5086
	$\tilde{g}\tilde{g}, \tilde{g} \rightarrow q\tilde{q}\tilde{\chi}_1^0, \tilde{\chi}_1^0 \rightarrow q\tilde{q}$	0	4-5 large-R jets	-	36.1	$\tilde{g}$	1.875 TeV	$m(\tilde{\chi}_1^0) = 1075 \text{ GeV}$	SUSY-2016-22
	$\tilde{g}\tilde{g}, \tilde{g} \rightarrow t\tilde{b}\tilde{\chi}_1^0, \tilde{\chi}_1^0 \rightarrow q\tilde{q}$	1 $e, \mu$	8-10 jets/0-4 b	-	36.1	$\tilde{g}$	2.1 TeV	$m(\tilde{\chi}_1^0) = 1 \text{ TeV}, \lambda'_{112} \neq 0$	1704.08493
	$\tilde{g}\tilde{g}, \tilde{g} \rightarrow \tilde{t}_1 t, \tilde{t}_1 \rightarrow bs$	1 $e, \mu$	8-10 jets/0-4 b	-	36.1	$\tilde{g}$	1.65 TeV	$m(\tilde{t}_1) = 1 \text{ TeV}, \lambda'_{323} \neq 0$	1704.08493
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1 \rightarrow bs$	0	2 jets + 2 b	-	36.7	$\tilde{t}_1$	100-470 GeV	$\text{BR}(\tilde{t}_1 \rightarrow be \mu) > 20\%$	1710.07171
	$\tilde{t}_1\tilde{t}_1, \tilde{t}_1 \rightarrow b\tilde{\ell}$	2 $e, \mu$	2 b	-	36.1	$\tilde{t}_1$	480-510 GeV		1710.05544
	Other	Scalar charm, $\tilde{c} \rightarrow c\tilde{\chi}_1^0$	0	2 c	Yes	20.3	$\tilde{c}$	510 GeV	$m(\tilde{\chi}_1^0) < 200 \text{ GeV}$

\*Only a selection of the available mass limits on new states or phenomena is shown. Many of the limits are based on simplified models, c.f. refs. for the assumptions made.

10<sup>-1</sup> 1 Mass scale [TeV]

These and more results on <https://wiki.cern.ch/wiki/bin/view/AtlasPublic/SupersymmetryPublicResults>



# Summary



- 43.9 fb<sup>-1</sup> were collected in 2017
- Total in 2015-2017 80 fb<sup>-1</sup>
- ATLAS has shown high performance despite the hard environment
- 84 papers have been published in 2017 (+60 submitted)





# СПАСИБО И С НОВЫМ ГОДОМ !

