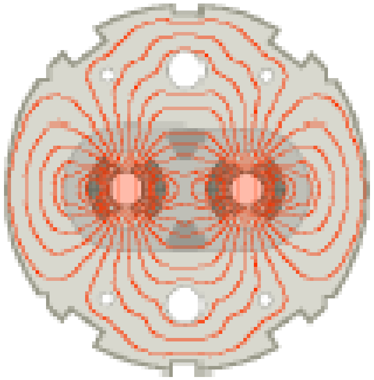
Новости ATLAS и CMS по хиггсам



LHC

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Совещание российских групп АТЛАС,

ОИЯИ, Дубна, Россия, 22.09.2015

Содержание

- Результаты ATLAS и CMS по константам связи
- Комбинация ATLAS+CMS по массе и константам связи
- Спин и четность бозона Хиггса в ATLAS
- Дифференциальные сечения в H→4*l* и H→$\gamma\gamma$ в ATLAS
- Поиск H в редких и нестандартных каналах распада
  H→J/Ψ γ, $\Upsilon\gamma$ (ATLAS), VBF H→inv (ATLAS), H→$\mu\tau$ (ATLAS+CMS)
- Заключение

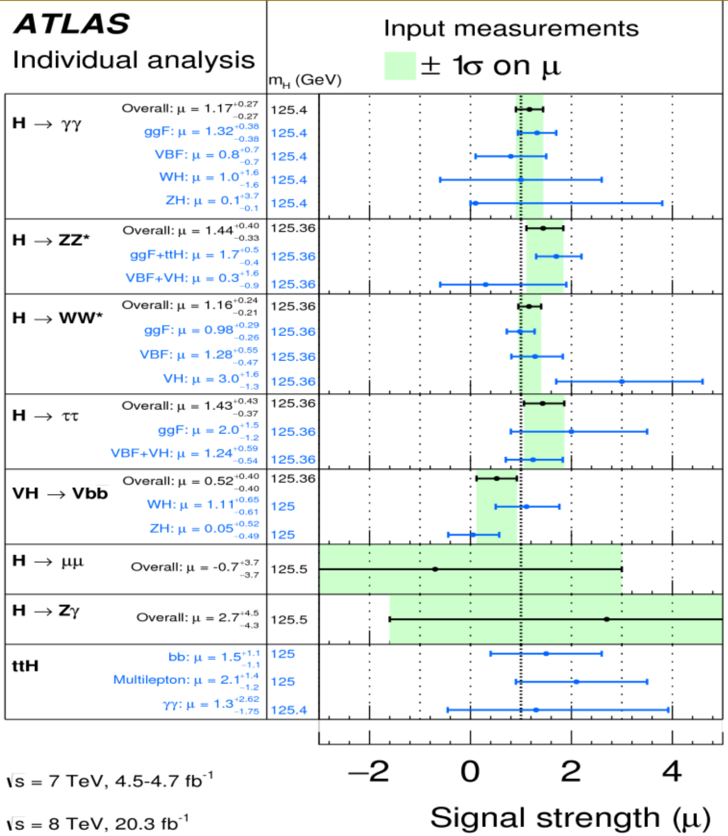
ATLAS and CMS individual combinations

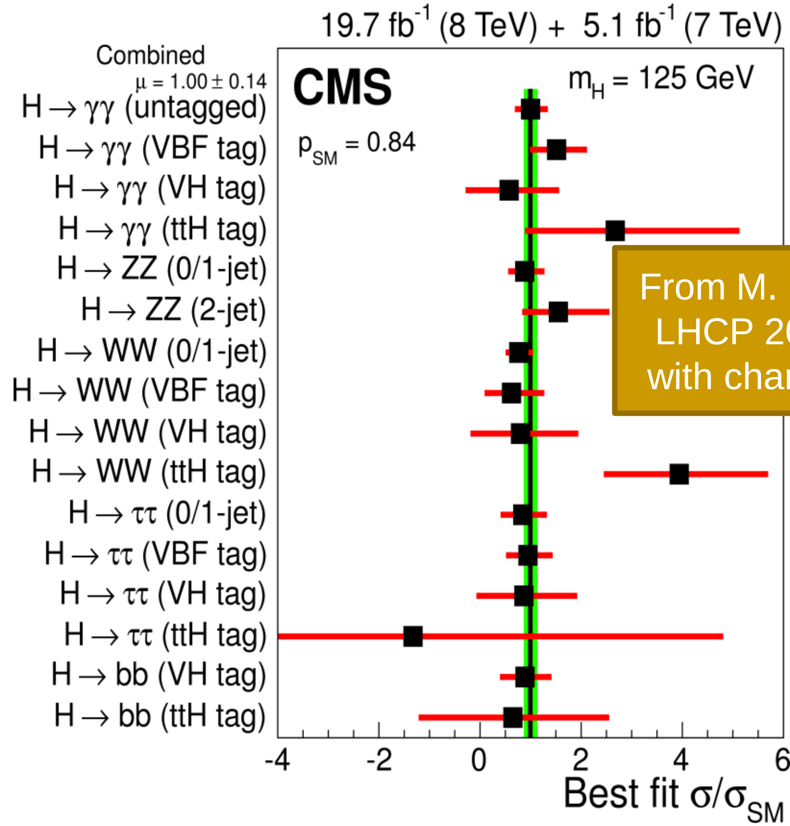
couplings: arXiv:1507.04548

mass: PRL 114 (2015) 191803, m_H=125.36 GeV

mass and couplings: EPJC 75 (2015) 212

m_H=125.02 GeV





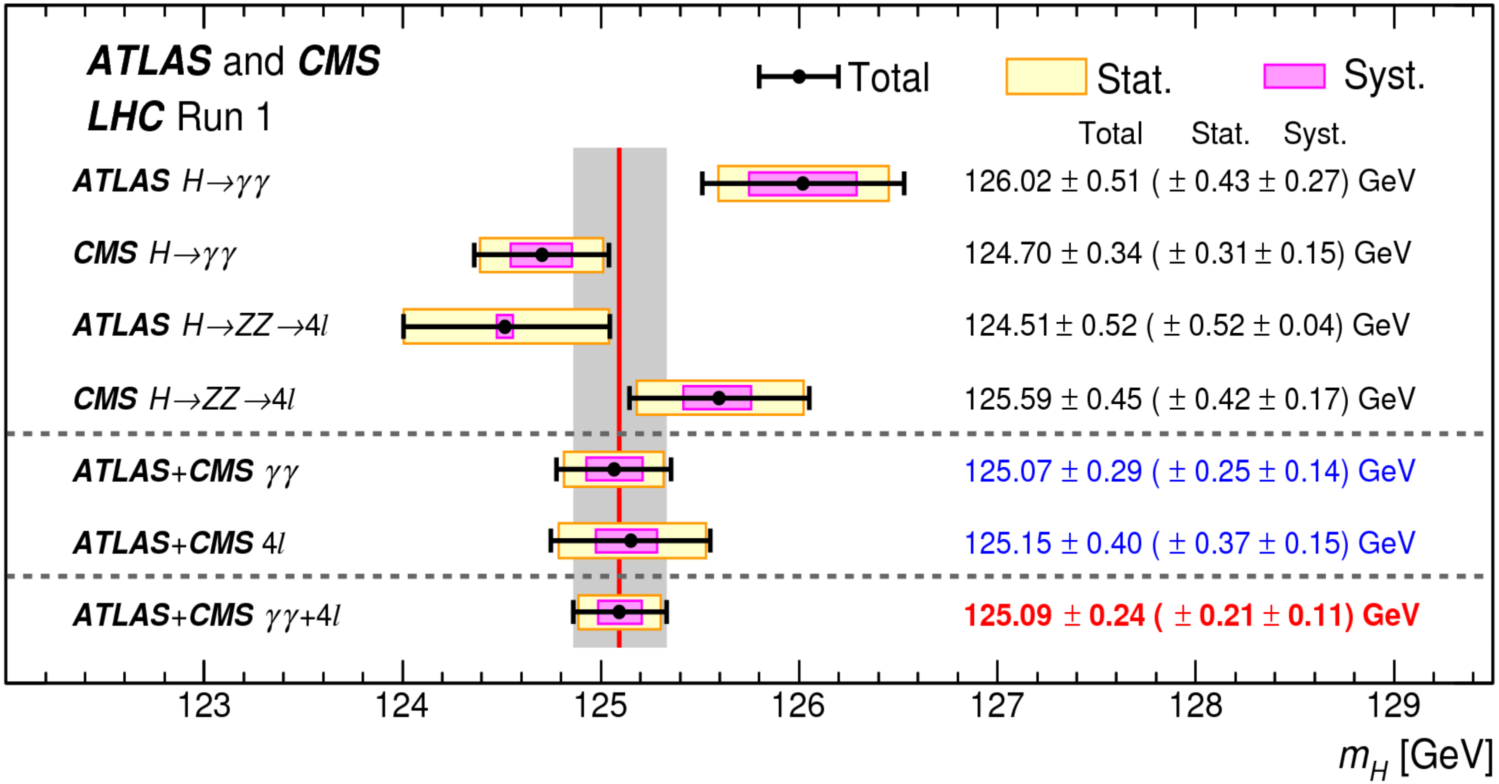
From M. Pieri, LHCP 2015, with changes

μ=1.18 ±0.10(stat.)±0.07(syst.)±0.08(th.)

μ=1.00±0.09(stat.)±0.07(syst.)±0.08(th.)

Higgs boson: measured mass

PRL 114 (2015) 191803



- Agreement between averaged masses obtained in H→γγ and H→4*l* modes
- <2σ tensions between masses in these modes in individual experiments
- Statistical error still dominates (in all cases considered)

ATLAS+CMS combination: H boson couplings

- Five production processes (ggF, VBF, WH, ZH and ttH)
- Six decay channels (ZZ^*, WW^*, $\gamma\gamma$, bb, $\tau\tau$, $\mu\mu$)
- Higgs boson mass 125.09 GeV
- Complete 7 TeV (≈5 fb^{-1}) and 8 TeV (≈20 fb^{-1}) datasets

ATLAS-CONF-2015-044
CMS-PAS-HIG-15-02

Theoretical cross sections and branching ratios for SM Higgs boson

Production process	Cross section [pb] $\sqrt{s} = 7$ TeV	Cross section [pb] $\sqrt{s} = 8$ TeV
ggF	15.0 ± 1.6	19.2 ± 2.0
VBF	1.22 ± 0.03	1.58 ± 0.04
WH	0.577 ± 0.016	0.703 ± 0.018
ZH	0.334 ± 0.013	0.414 ± 0.016
$[ggZH]$	0.023 ± 0.007	0.032 ± 0.010
bbH	0.156 ± 0.021	0.203 ± 0.028
ttH	0.086 ± 0.009	0.129 ± 0.014
tH	0.012 ± 0.001	0.018 ± 0.001
Total	17.4 ± 1.6	22.3 ± 2.0

Decay channel	Branching ratio [%]
$H \to bb$	57.5 ± 1.9
$H \to WW$	21.6 ± 0.9
$H \to gg$	8.56 ± 0.86
$H \to \tau\tau$	6.30 ± 0.36
$H \to cc$	2.90 ± 0.35
$H \to ZZ$	2.67 ± 0.11
$H \to \gamma\gamma$	0.228 ± 0.011
$H \to Z\gamma$	0.155 ± 0.014
$H \to \mu\mu$	0.022 ± 0.001

Higgs boson signal strength, μ

From M. Pieri, LHCP 2015, with changes

- μ is the so called signal strength (μ=1 in the SM)
- $\mu_i = \frac{\sigma_i}{\sigma_i^{SM}}$ and $\mu^f = \frac{BR^f}{BR^f_{SM}}.$ $\mu_i^f \equiv \frac{\sigma_i \cdot BR^f}{(\sigma_i \cdot BR^f)_{SM}} = \mu_i \times \mu^f$
- Most constrained parameterization: one single signal strength μ (and assuming the same at 7 and 8 TeV)

$$\mu = 1.09^{+0.11}_{-0.10} \quad = 1.09^{+0.07}_{-0.07}\,(\text{stat})\,^{+0.04}_{-0.04}\,(\text{expt})\,^{+0.03}_{-0.03}\,(\text{thbgd})^{+0.07}_{-0.06}\,(\text{thsig})$$

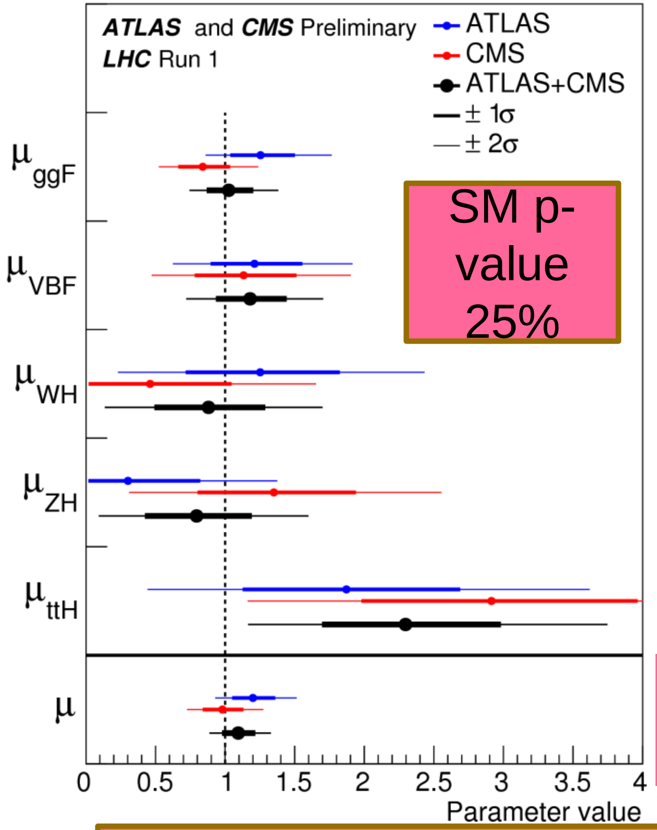
- Expected uncertainties very similar to observed
- Signal theory uncertainty due to QCD scale and PDF as large as statistical uncertainty. Being reduced from the theory side

See talk of Alessandro Vicini at LHCP

All other measurement still dominated by statistical uncertainties

Higgs boson signal strength w.r.t SM, μ

SM BR assumed



SM p-value 25%

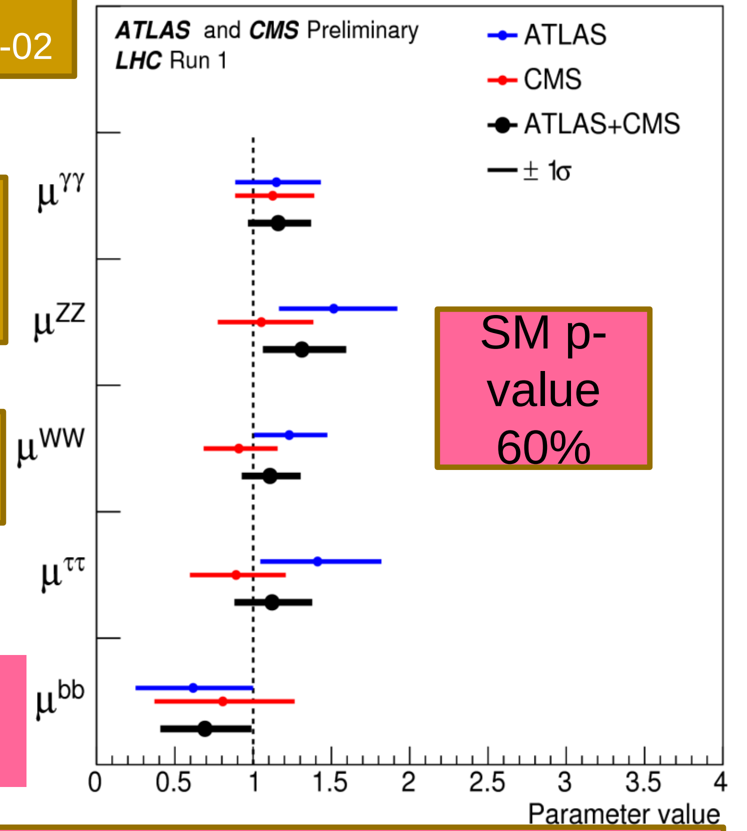
ATLAS-CONF-2015-044
CMS-PAS-HIG-15-02

From M. Pieri, LHCP 2015, with modifications

m_H=125.09 GeV in combination

$\mu = 1.09^{+0.11}_{-0.10}$

SM production σ assumed



SM p-value 60%

- Signal strengths in different channels are consistent with SM, i.e. unity
- Largest difference in ttH: 2.3σ above SM prediction
- H boson average signal strength is measured with 10% precision

ATLAS+CMS: significance in different channels

- Comparing likelihood of the best-fit with $\mu_{prod}=0$ and $\mu^{decay}=0$ we obtain:

Production process	Observed Significance(σ)	Expected Significance (σ)
VBF	**5.4**	**4.7**
WH	2.4	2.7
ZH	2.3	2.9
VH	3.5	4.2
ttH	4.4	2.0
Decay channel		
H→ττ	**5.5**	**5.0**
H→bb	2.6	3.7

From M. Pieri, LHCP 2015

- Combination largely increases the sensitivity

VBF and H→ττ now established at over 5 σ. Same as ggF and H→ZZ, γγ, WW from single experiments

Higgs boson in ATLAS: spin and parity

arXiv:1506.05669, accepted by EPJC

- Channels tested: H→ZZ*→4*l*, H→WW→eνμν, H→γγ
- Hypotheses tested: 0^+ (main), BSM 0^-, 0_h^+, 2^+ with universal and non-iniversal couplings to fermions and vector bosons
- Tensor structure of HVV interaction (0^+) also started to be studied

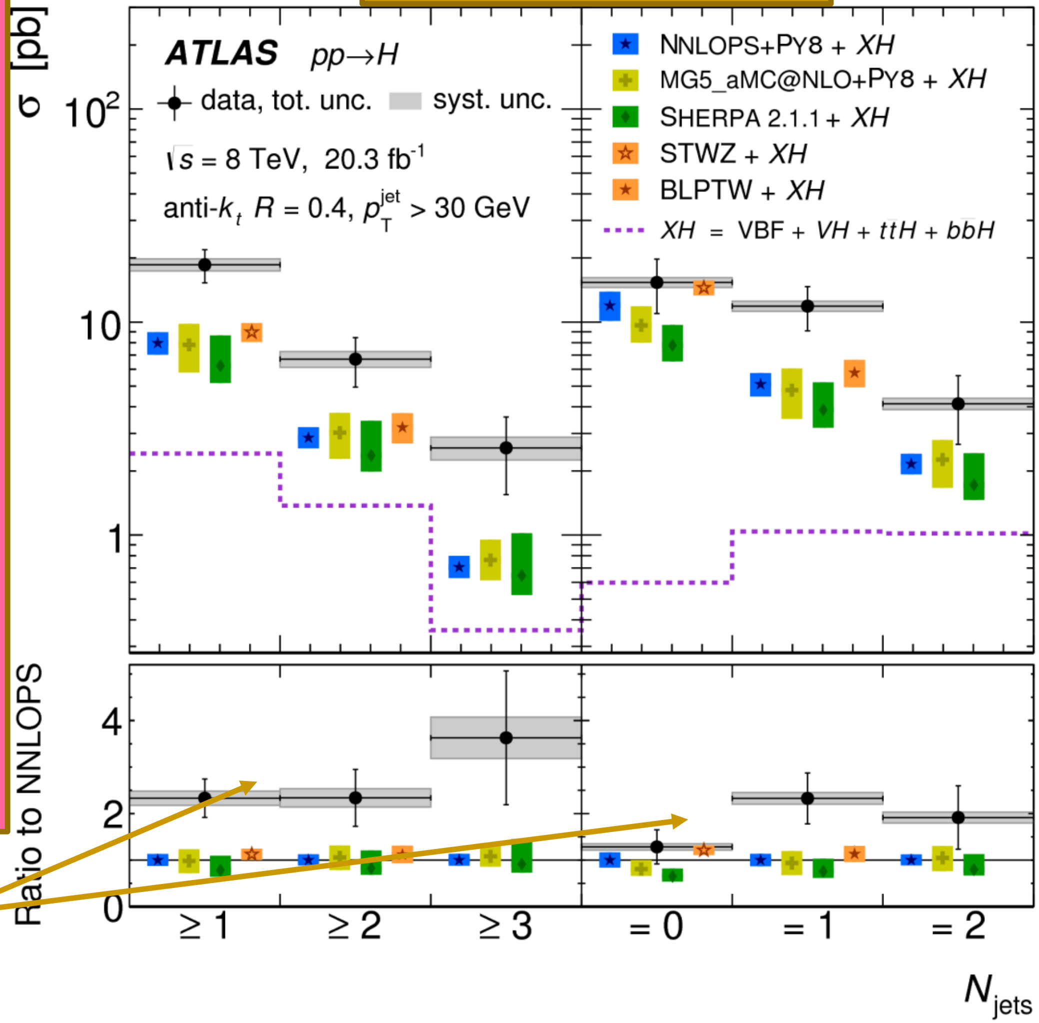
Tested Hypothesis	$p^{\rm alt}_{\exp,\mu=1}$	$p^{\rm alt}_{\exp,\mu=\hat{\mu}}$	$p^{\rm SM}_{\rm obs}$	$p^{\rm alt}_{\rm obs}$	Obs. $\mathrm{CL_s}$ (%)
0_h^+	$2.5 \cdot 10^{-2}$	$4.7 \cdot 10^{-3}$	0.85	$7.1 \cdot 10^{-5}$	$4.7 \cdot 10^{-2}$
0^-	$1.8 \cdot 10^{-3}$	$1.3 \cdot 10^{-4}$	0.88	$< 3.1 \cdot 10^{-5}$	$< 2.6 \cdot 10^{-2}$
$2^+(\kappa_q = \kappa_g)$	$4.3 \cdot 10^{-3}$	$2.9 \cdot 10^{-4}$	0.61	$4.3 \cdot 10^{-5}$	$1.1 \cdot 10^{-2}$
$2^+(\kappa_q = 0;\ p_{\rm T} < 300 GeV)$	$< 3.1 \cdot 10^{-5}$	$< 3.1 \cdot 10^{-5}$	0.52	$< 3.1 \cdot 10^{-5}$	$< 6.5 \cdot 10^{-3}$
$2^+(\kappa_q = 0;\ p_{\rm T} < 125 GeV)$	$3.4 \cdot 10^{-3}$	$3.9 \cdot 10^{-4}$	0.71	$4.3 \cdot 10^{-5}$	$1.5 \cdot 10^{-2}$
$2^+(\kappa_q = 2\kappa_g;\ p_{\rm T} < 300 GeV)$	$< 3.1 \cdot 10^{-5}$	$< 3.1 \cdot 10^{-5}$	0.28	$< 3.1 \cdot 10^{-5}$	$< 4.3 \cdot 10^{-3}$
$2^+(\kappa_q = 2\kappa_g;\ p_{\rm T} < 125 GeV)$	$7.8 \cdot 10^{-3}$	$1.2 \cdot 10^{-3}$	0.80	$7.3 \cdot 10^{-5}$	$3.7 \cdot 10^{-2}$

- All alternative to 0^+ hypotheses considered excluded at >99.9% CL
- $1^+/1^-$ hypotheses (forbidden by Landau-Yang theorem for H→γγ) excluded earlier
- No deviations from SM are found in the first study of HVV tensor structure

$H \rightarrow 4l$ and $H \rightarrow \gamma\gamma$ differential cross sections in ATLAS

- Distributions on different kinematical variables (Y_H, p_T^H, N_{jets}, p_T(lead. jet)) were studied
- Total σ obtained
- Comparison with different event generators was performed
- P-values quantifying the compatibility of measured shapes and predictions range from 8% to 88%

PRL 115 (2015) 091801



Example: distribution on jet multiplicities

VBF H→invisible

arXiv:1508.07869, submitted to JHEP

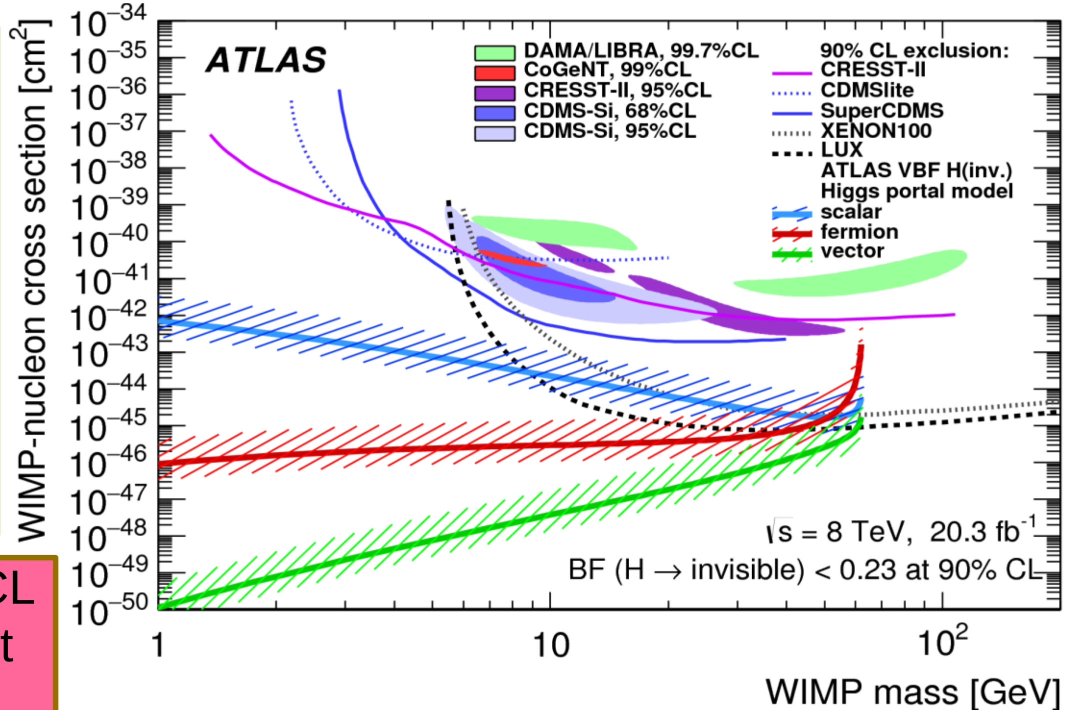
Obtained/expected limits on BR(H→inv.) for VBF mechanism

Results	Expected	$+1\sigma$	-1σ	$+2\sigma$	-2σ	Observed
SR1	0.35	0.49	0.25	0.67	0.19	0.30
SR2	0.60	0.85	0.43	1.18	0.32	0.83
Combined Results	0.31	0.44	0.23	0.60	0.17	0.28

CMS: limit of 0.58 based on VBF and ZH channels EPJC74 (2014)2980

Signature:

- two very high p_T–jets with large invariant-mass and rapidity separation
- Third jet veto
- very large E_T^{miss}



Obtained limit of 0.28 at 95% CL on BR(H→inv.) is the best limit on this BR achieved so far

Rare H and Z decays to J/ψγ and Υγ in ATLAS

PRL 114 (2015) 121801

Quarkonia were reconstructed using their $\mu^+\mu^-$ decays

	95% CL_s Upper Limits				
	J/ψ	$\Upsilon(1S)$	$\Upsilon(2S)$	$\Upsilon(3S)$	$\sum^n \Upsilon(nS)$
$\mathcal{B}(Z \to \mathcal{Q}\gamma)\,[\,10^{-6}\,]$					
Expected	$2.0^{+1.0}_{-0.6}$	$4.9^{+2.5}_{-1.4}$	$6.2^{+3.2}_{-1.8}$	$5.4^{+2.7}_{-1.5}$	$8.8^{+4.7}_{-2.5}$
Observed	2.6	3.4	6.5	5.4	7.9
$\mathcal{B}(H \to \mathcal{Q}\gamma)\,[\,10^{-3}\,]$					
Expected	$1.2^{+0.6}_{-0.3}$	$1.8^{+0.9}_{-0.5}$	$2.1^{+1.1}_{-0.6}$	$1.8^{+0.9}_{-0.5}$	$2.5^{+1.3}_{-0.7}$
Observed	1.5	1.3	1.9	1.3	2.0
$\sigma(pp \to H) \times \mathcal{B}(H \to \mathcal{Q}\gamma)$ [fb]					
Expected	26^{+12}_{-7}	38^{+19}_{-11}	45^{+24}_{-13}	38^{+19}_{-11}	54^{+27}_{-15}
Observed	33	29	41	28	44

No one from considered rare decays was observed

Exotic LFV H→μτ decay in ATLAS and CMS

	SR1	SR2	Combined
Expected limit on $\mathrm{Br}(H \to \mu\tau)$ [%]	$1.60^{+0.64}_{-0.45}$	$1.75^{+0.71}_{-0.49}$	$1.24^{+0.50}_{-0.35}$
Observed limit on $\mathrm{Br}(H \to \mu\tau)$ [%]	1.55	3.51	1.85
Best fit $\mathrm{Br}(H \to \mu\tau)$ [%]	$-0.07^{+0.81}_{-0.86}$	$1.94^{+0.92}_{-0.89}$	0.77±0.62

ATLAS:
arXiv:1508.03372,
submitted to JHEP

1.3σ effect
(difference from zero)

	0-Jet (%)	1-Jet (%)	2-Jets (%)
Expected Limits			
$\mu\tau_e$	<1.32 (±0.67)	<1.66 (±0.85)	<3.77 (±1.92)
$\mu\tau_h$	<2.34 (±1.19)	<2.07 (±1.06)	<2.31 (±1.18)
$\mu\tau$	<0.75 (±0.38)		
Observed Limits			
$\mu\tau_e$	<2.04	<2.38	<3.84
$\mu\tau_h$	<2.61	<2.22	<3.68
$\mu\tau$	<1.51		
Best Fit Branching Fractions			
$\mu\tau_e$	$0.87^{+0.66}_{-0.62}$	$0.81^{+0.85}_{-0.78}$	$0.05^{+1.58}_{-0.97}$
$\mu\tau_h$	$0.41^{+1.20}_{-1.22}$	$0.21^{+1.03}_{-1.09}$	$1.48^{+1.16}_{-0.93}$
$\mu\tau$	$0.84^{+0.39}_{-0.37}$		

CMS:
PLB 749 (2015) 337

2.3σ effect
(difference from zero)

Conclusion

ATLAS and CMS experiments at LHC discovered neutral boson with mass ≈125 GeV having production cross section compatible with SM Higgs boson

Measurements of the new boson couplings were performed and they are all in agreement with SM predictions

Different spin/parity hypotheses were tested and the SM-predicted hypothesis, 0^+ , has very strong preference

ATLAS and CMS continue to study properties of the discovered particle and plan to improve the measurements with 13-14 TeV data expected starting from 2015

Channel	References for individual publications		Signal strength [μ] from results in this paper (Section ??)		Signal significance [σ]	
	ATLAS	CMS	ATLAS	CMS	ATLAS	CMS
$H \to \gamma\gamma$	[52]	[53]	$1.15^{+0.27}_{-0.25}$	$1.12^{+0.25}_{-0.23}$	5.0	5.6
			$\left(^{+0.26}_{-0.24}\right)$	$\left(^{+0.24}_{-0.22}\right)$	(4.6)	(5.1)
$H \to ZZ \to 4\ell$	[54]	[55]	$1.51^{+0.39}_{-0.34}$	$1.05^{+0.32}_{-0.27}$	6.6	7.0
			$\left(^{+0.33}_{-0.27}\right)$	$\left(^{+0.31}_{-0.26}\right)$	(5.5)	(6.8)
$H \to WW$	[56,57]	[58]	$1.23^{+0.23}_{-0.21}$	$0.91^{+0.24}_{-0.21}$	6.8	4.8
			$\left(^{+0.21}_{-0.20}\right)$	$\left(^{+0.23}_{-0.20}\right)$	(5.8)	(5.6)
$H \to \tau\tau$	[59]	[60]	$1.41^{+0.40}_{-0.35}$	$0.89^{+0.31}_{-0.28}$	4.4	3.4
			$\left(^{+0.37}_{-0.33}\right)$	$\left(^{+0.31}_{-0.29}\right)$	(3.3)	(3.7)
$H \to bb$	[38]	[39]	$0.62^{+0.37}_{-0.36}$	$0.81^{+0.45}_{-0.42}$	1.7	2.0
			$\left(^{+0.39}_{-0.37}\right)$	$\left(^{+0.45}_{-0.43}\right)$	(2.7)	(2.5)
$H \to \mu\mu$	[61]	[62]	-0.7 ± 3.6	0.8 ± 3.5		
			(± 3.6)	(± 3.5)		
ttH production	[63,64,28]	[66]	$1.9^{+0.8}_{-0.7}$	$2.9^{+1.0}_{-0.9}$	2.7	3.6
			$\left(^{+0.72}_{-0.66}\right)$	$\left(^{+0.88}_{-0.80}\right)$	(1.6)	(1.3)

	Best-fit μ	Uncertainty				
		Total	Stat	Expt	Thbgd	Thsig
ATLAS and CMS (meas.)	1.09	$^{+0.11}_{-0.10}$	$^{+0.07}_{-0.07}$	$^{+0.04}_{-0.04}$	$^{+0.03}_{-0.03}$	$^{+0.07}_{-0.06}$
ATLAS and CMS (exp.)	–	$^{+0.11}_{-0.10}$	$^{+0.07}_{-0.07}$	$^{+0.04}_{-0.04}$	$^{+0.03}_{-0.03}$	$^{+0.06}_{-0.06}$
ATLAS (meas.)	1.20	$^{+0.15}_{-0.14}$	$^{+0.10}_{-0.10}$	$^{+0.06}_{-0.06}$	$^{+0.04}_{-0.04}$	$^{+0.08}_{-0.07}$
CMS (meas.)	0.98	$^{+0.14}_{-0.13}$	$^{+0.10}_{-0.09}$	$^{+0.06}_{-0.05}$	$^{+0.04}_{-0.04}$	$^{+0.08}_{-0.07}$

Production process	ATLAS+CMS	ATLAS	CMS
μ_{ggF}	$1.03^{+0.17}_{-0.15}$	$1.25^{+0.24}_{-0.21}$	$0.84^{+0.19}_{-0.16}$
μ_{VBF}	$1.18^{+0.25}_{-0.23}$	$1.21^{+0.33}_{-0.30}$	$1.13^{+0.37}_{-0.34}$
μ_{WH}	$0.88^{+0.40}_{-0.38}$	$1.25^{+0.56}_{-0.52}$	$0.46^{+0.57}_{-0.54}$
μ_{ZH}	$0.80^{+0.39}_{-0.36}$	$0.30^{+0.51}_{-0.46}$	$1.35^{+0.58}_{-0.54}$
μ_{ttH}	$2.3^{+0.7}_{-0.6}$	$1.9^{+0.8}_{-0.7}$	$2.9^{+1.0}_{-0.9}$

Backup slides

κ-framework: BSM coupling modifiers

- The k-framework has been developed within the LHC Higgs Cross Section WG
- Higgs boson couplings are scaled by coupling modifiers κ
- The definition is such that:

From M. Pieri, LHCP 2015

$$\kappa_j^2 = \sigma_j / \sigma_j^{\mathrm{SM}} \quad \text{or} \quad \kappa_j^2 = \Gamma^j / \Gamma^j_{\mathrm{SM}}$$

$$\kappa_H^2 = \sum_j \mathrm{BR}^j_{\mathrm{SM}} \kappa_j^2 \qquad \Gamma_{\mathrm{H}} = \frac{\kappa_H^2 \cdot \Gamma_H^{\mathrm{SM}}}{1 - \mathrm{BR}_{\mathrm{BSM}}}$$

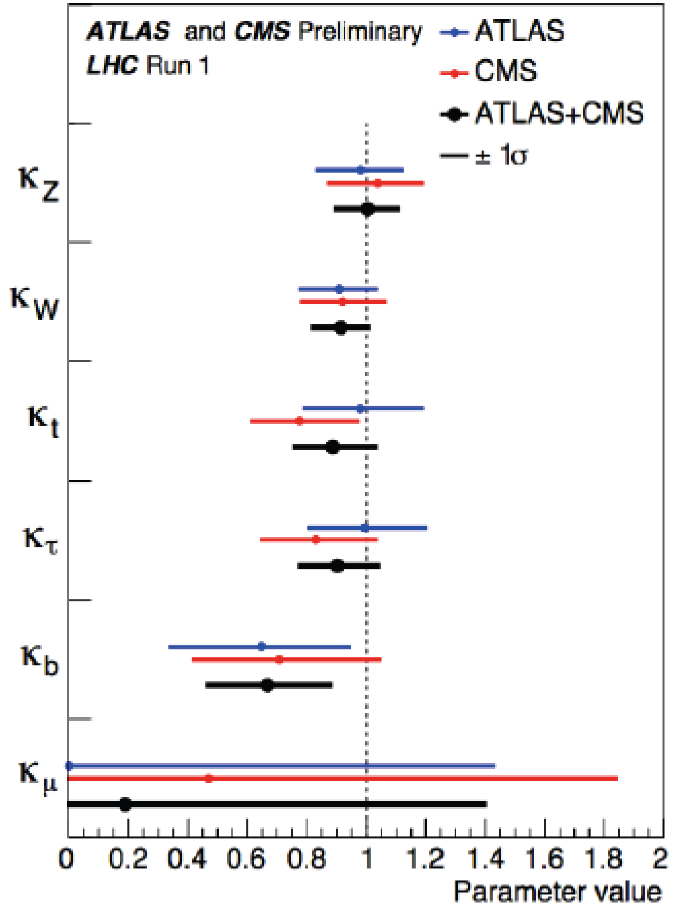
- With $\mathrm{BR}_{\mathrm{BSM}}$ the BR of invisible + undetected decays
  - Undetected decays can be either non SM decays or come from different BRs of known but not measured decays: cc, gg, …

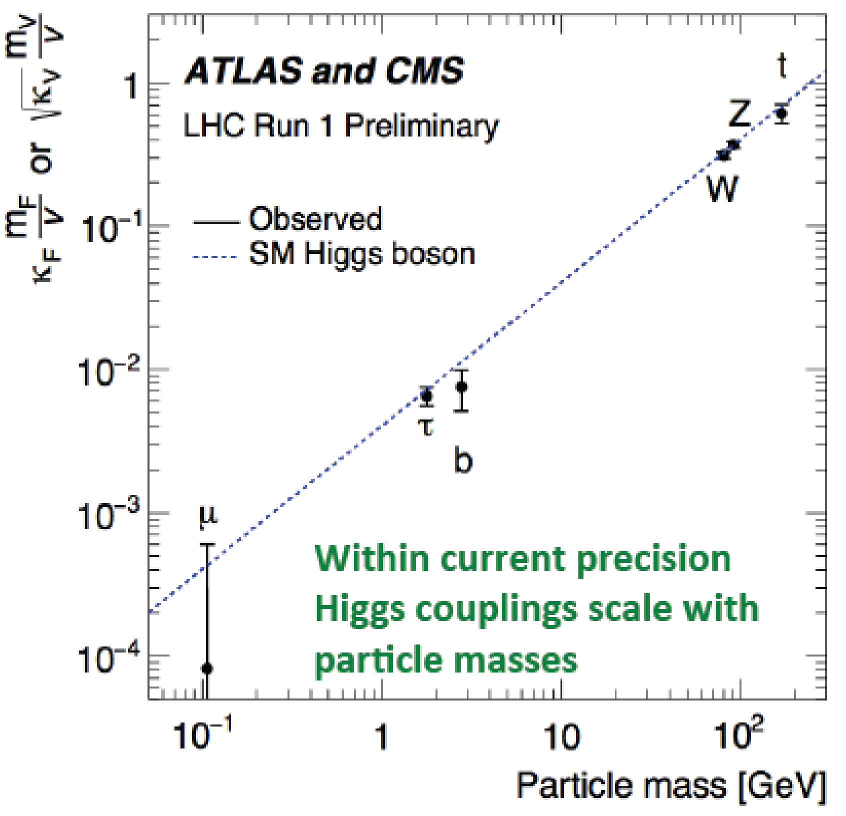
If New Physics lower than $m_H/2$, $\mathrm{BR}_{\mathrm{BSM}}$ could be affected
If above $m_H/2$, effective couplings of the loops would be modified

No BSM in the loops

From M. Pieri, LHCP 2015

- Fitting the 5 main tree level coupling modifiers + κ_μ and resolving all the loops.

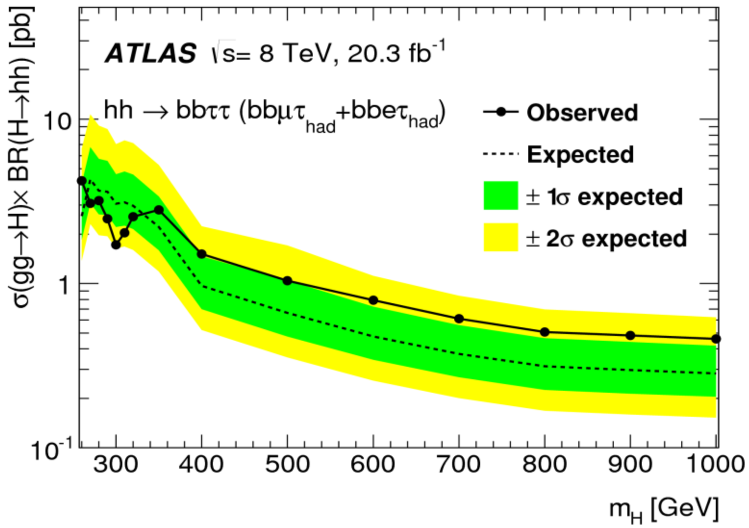


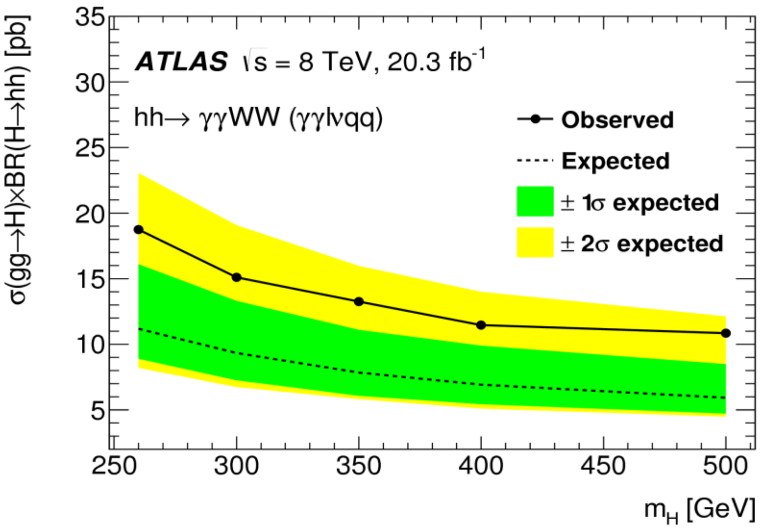


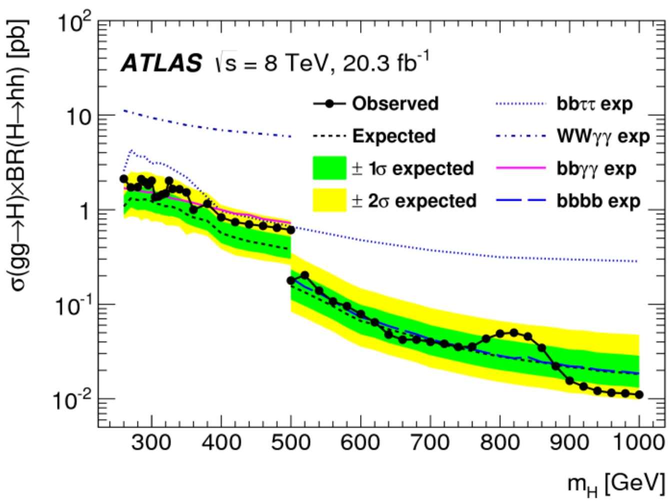
Within current precision Higgs couplings scale with particle masses

Pair production of Higgs bosons in ATLAS

arXiv:1509.04670



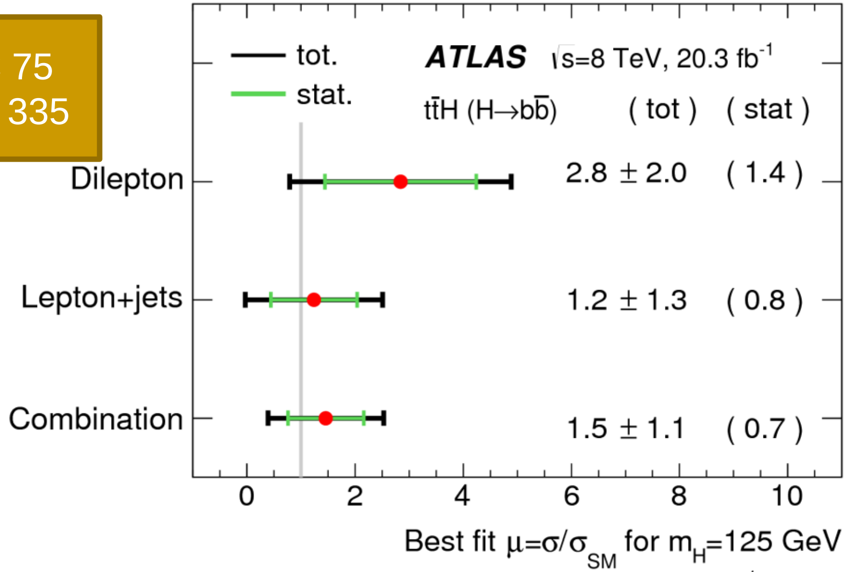




- 0.69 pb limit on non-resonant hh-production, 70 times larger than SM cross section
- 2.1 pb (0.011 pb) limit on H→hh production for m_H = 260 GeV(1000 GeV)
- Interpretations of results in two simplified scenarios of MSSM

ttH, H→bb in ATLAS and CMS

EPJC 75 (2015) 335



- States with one or two electrons or muons
- Categorization of events according to N_{jets} and N_{btag}
- NN to separate signal from ttbb

Observed (expected) 95% CL limit is 3.4 (2.2) x σ_{SM}

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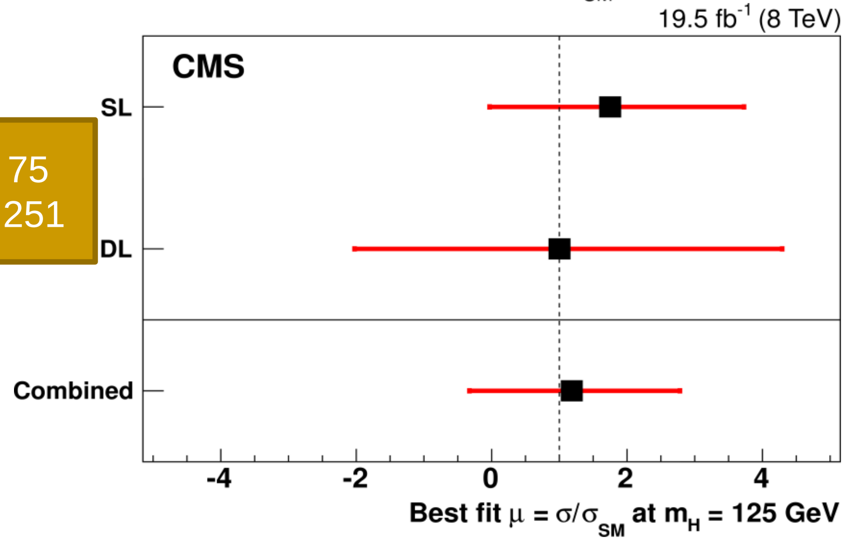
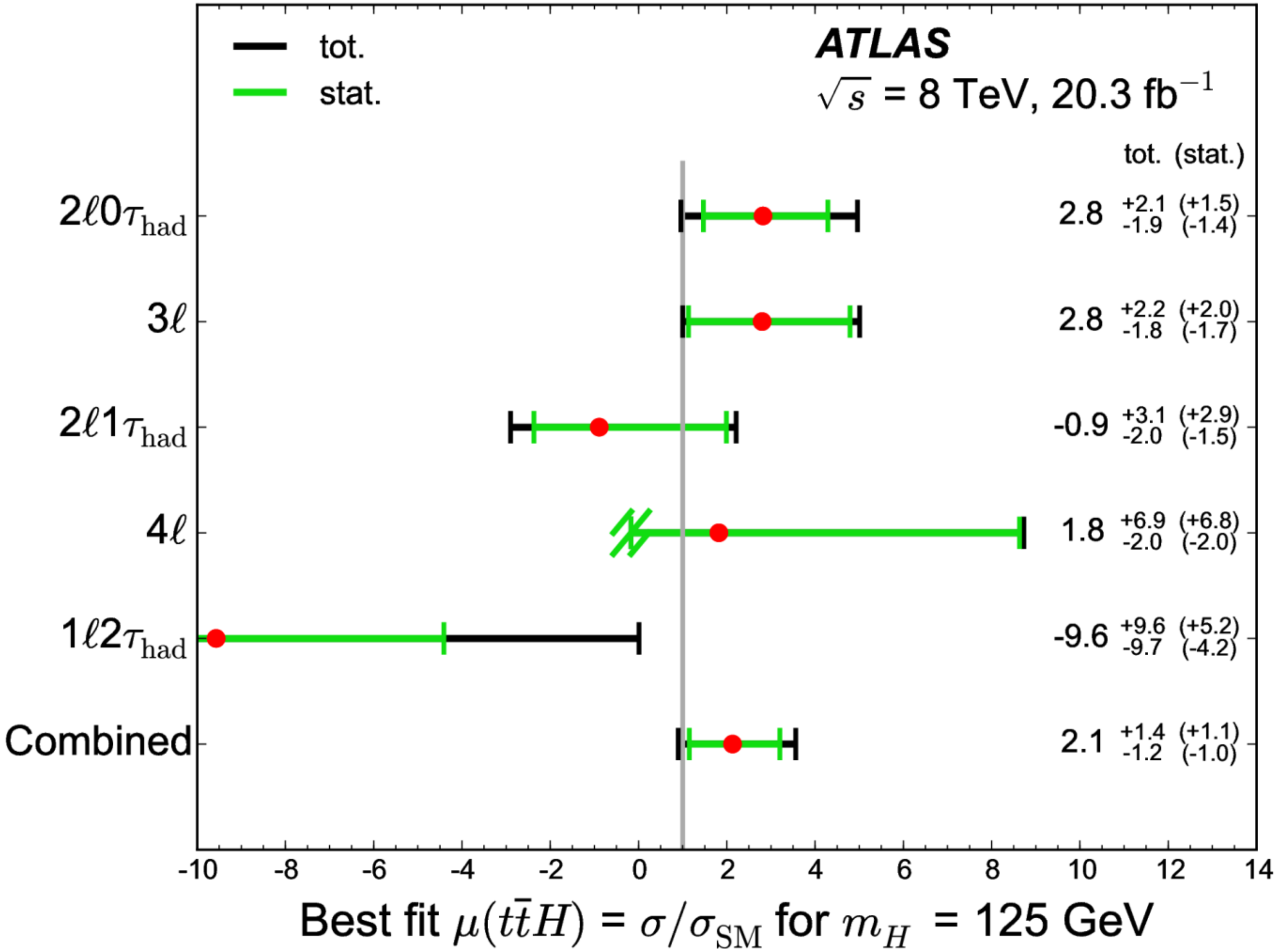


- States with jets plus one or two opposite-sign leptons
- Matrix element method to separate signal from ttbb BGR

Observed (expected) 95% CL limit is 4.2 (3.3) x σ_{SM}

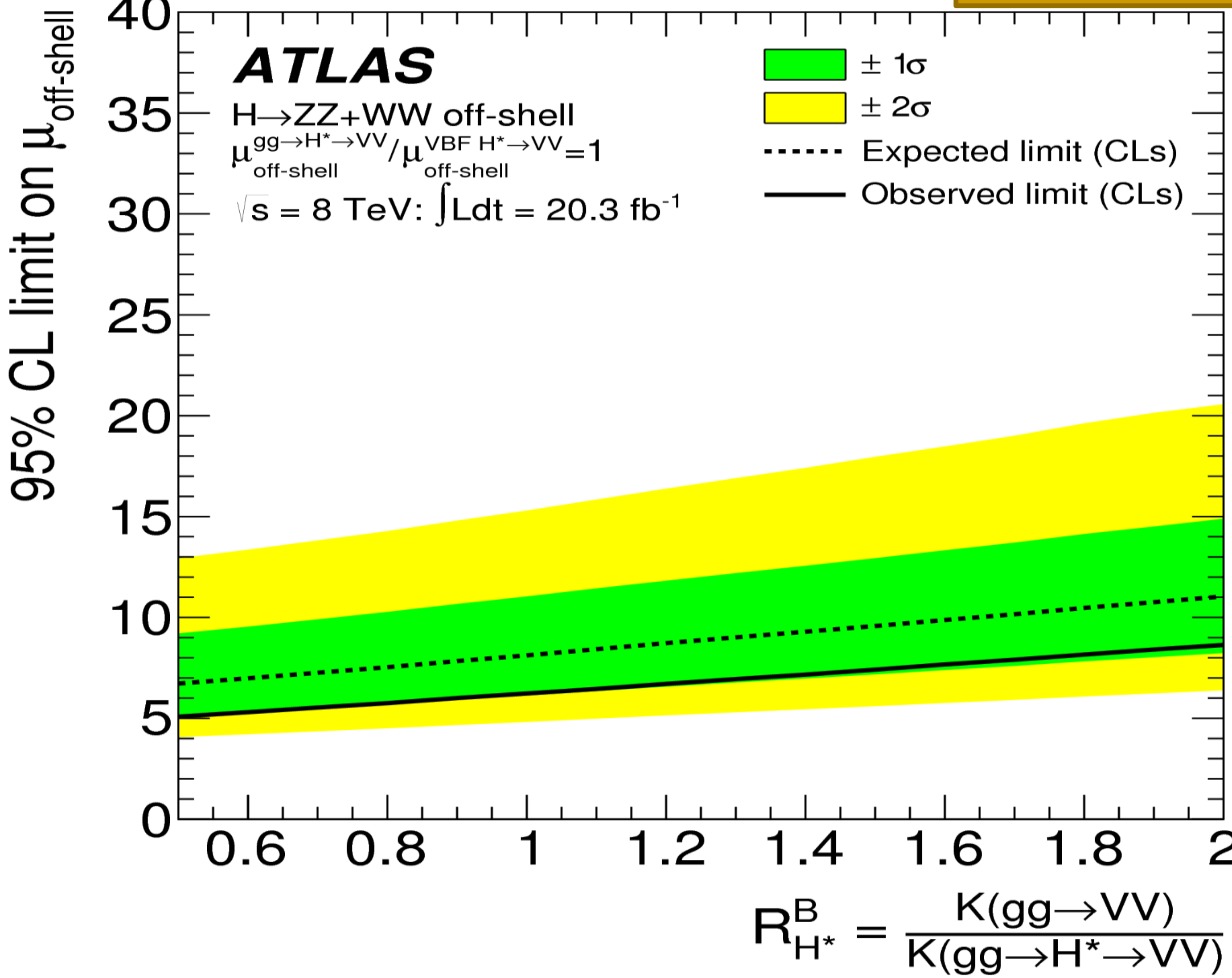
ttH, H→multileptons in ATLAS

PLB 749 (2015) 519



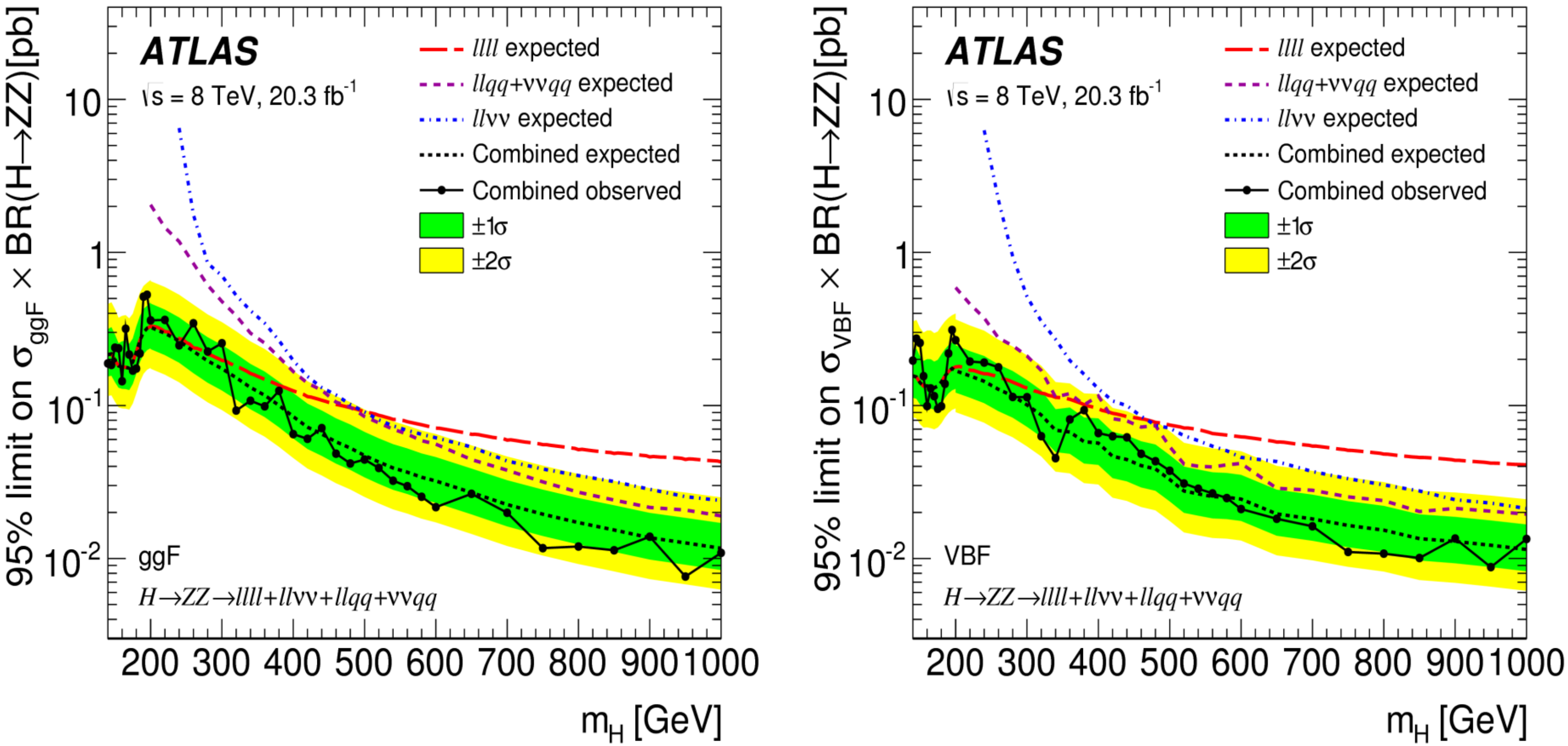
Off-shell H→WW and H→ZZ

EPJC 75 (2015) 335



Heavy Higgs boson in H→ZZ

arXiv:1507.05930



H→ZZ limits are closed to those obtained by ATLAS

Higgs boson in ATLAS: measured spin and parity

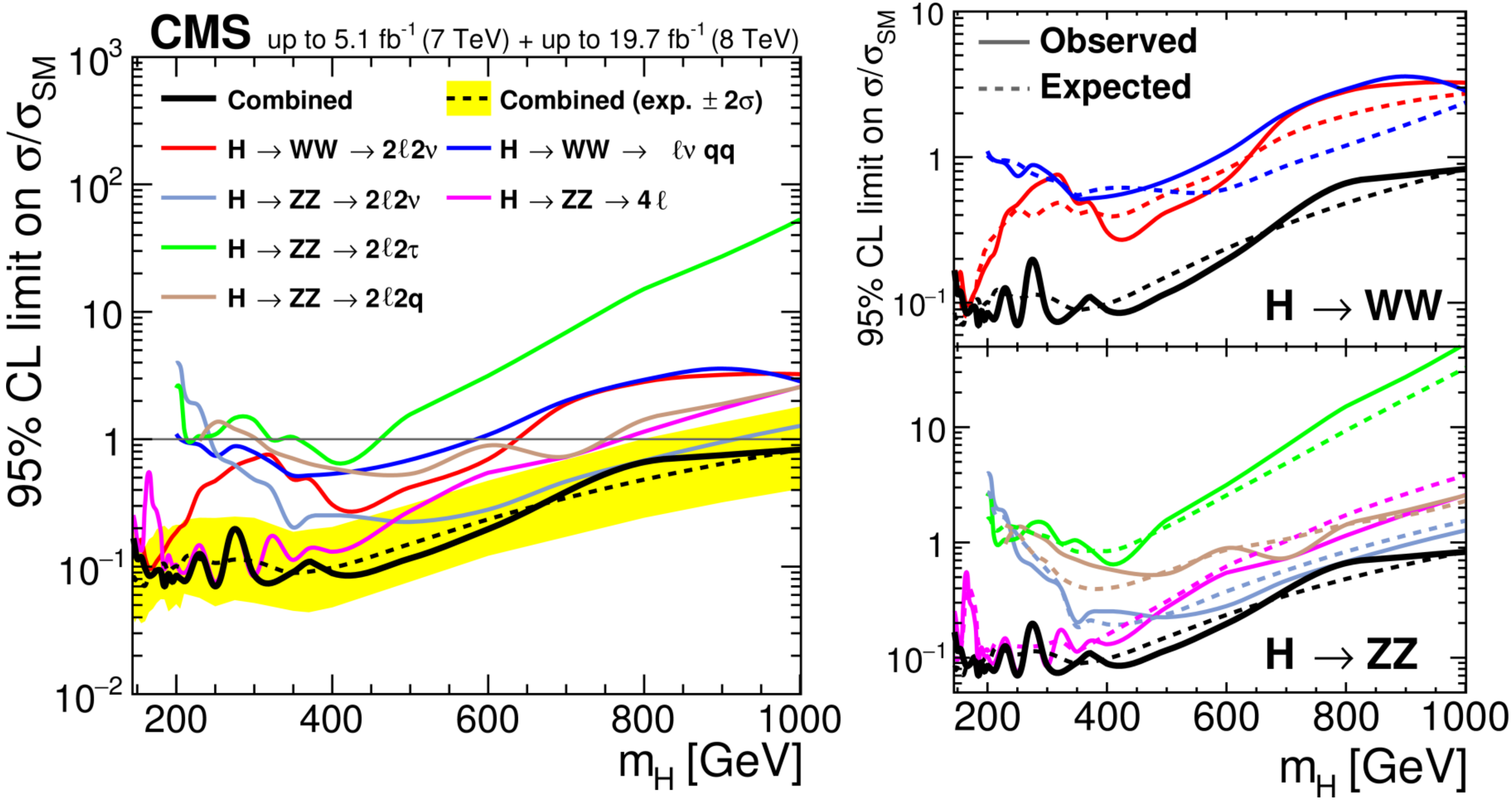
Details about each diboson channel tested

arXiv:1506.05669, accepted by EPJC

Tested Hypothesis	$p^{alt}_{exp,\mu=1}$	$p^{alt}_{exp,\mu=\hat{\mu}}$	p^{SM}_{obs}	p^{alt}_{obs}	Obs. CL_s (%)
		$H \to \gamma\gamma$			
$2^+(\kappa_q = \kappa_g)$	0.13	$7.5 \cdot 10^{-2}$	0.13	0.34	39
$2^+(\kappa_q = 0;\ p_T < 300GeV)$	$4.3 \cdot 10^{-4}$	$< 3.1 \cdot 10^{-5}$	0.16	$2.9 \cdot 10^{-4}$	$3.5 \cdot 10^{-2}$
$2^+(\kappa_q = 0;\ p_T < 125GeV)$	$9.4 \cdot 10^{-2}$	$5.6 \cdot 10^{-2}$	0.23	0.20	26
$2^+(\kappa_q = 2\kappa_g;\ p_T < 300GeV)$	$9.1 \cdot 10^{-4}$	$< 3.1 \cdot 10^{-5}$	0.16	$8.6 \cdot 10^{-4}$	0.10
$2^+(\kappa_q = 2\kappa_g;\ p_T < 125GeV)$	0.27	0.24	0.20	0.54	68
		$H \to WW^* \to e\nu\mu\nu$			
Tested Hypothesis	$p^{alt}_{exp,\mu=1}$	$p^{alt}_{exp,\mu=\hat{\mu}}$	p^{SM}_{obs}	p^{alt}_{obs}	Obs. CL_s (%)
0^+_h	0.31	0.29	0.91	$2.7 \cdot 10^{-2}$	29
0^-	$6.4 \cdot 10^{-2}$	$3.2 \cdot 10^{-2}$	0.65	$1.2 \cdot 10^{-2}$	3.5
$2^+(\kappa_q = \kappa_g)$	$6.4 \cdot 10^{-2}$	$3.3 \cdot 10^{-2}$	0.25	0.12	16
$2^+(\kappa_q = 0;\ p_T < 300GeV)$	$1.5 \cdot 10^{-2}$	$4.0 \cdot 10^{-3}$	0.55	$3.0 \cdot 10^{-3}$	0.6
$2^+(\kappa_q = 0;\ p_T < 125GeV)$	$5.6 \cdot 10^{-2}$	$2.9 \cdot 10^{-2}$	0.42	$4.4 \cdot 10^{-2}$	7.5
$2^+(\kappa_q = 2\kappa_g;\ p_T < 300GeV)$	$1.5 \cdot 10^{-2}$	$4.0 \cdot 10^{-3}$	0.52	$3.0 \cdot 10^{-3}$	0.7
$2^+(\kappa_q = 2\kappa_g;\ p_T < 125GeV)$	$4.4 \cdot 10^{-2}$	$2.2 \cdot 10^{-2}$	0.69	$7.0 \cdot 10^{-3}$	2.2
		$H \to ZZ^* \to 4\ell$			
Tested Hypothesis	$p^{alt}_{exp,\mu=1}$	$p^{alt}_{exp,\mu=\hat{\mu}}$	p^{SM}_{obs}	p^{alt}_{obs}	Obs. CL_s (%)
0^+_h	$3.2 \cdot 10^{-2}$	$5.2 \cdot 10^{-3}$	0.80	$3.6 \cdot 10^{-4}$	0.18
0^-	$8.0 \cdot 10^{-3}$	$3.6 \cdot 10^{-4}$	0.88	$1.2 \cdot 10^{-5}$	$1.0 \cdot 10^{-2}$
$2^+(\kappa_q = \kappa_g)$	$3.3 \cdot 10^{-2}$	$5.7 \cdot 10^{-4}$	0.91	$3.6 \cdot 10^{-5}$	$4.0 \cdot 10^{-2}$
$2^+(\kappa_q = 0;\ p_T < 300GeV)$	$3.9 \cdot 10^{-2}$	$9.0 \cdot 10^{-3}$	0.95	$2.7 \cdot 10^{-5}$	$5.4 \cdot 10^{-2}$
$2^+(\kappa_q = 0;\ p_T < 125GeV)$	$4.6 \cdot 10^{-2}$	$1.1 \cdot 10^{-2}$	0.93	$3.0 \cdot 10^{-5}$	$4.3 \cdot 10^{-2}$
$2^+(\kappa_q = 2\kappa_g;\ p_T < 300GeV)$	$4.6 \cdot 10^{-2}$	$1.1 \cdot 10^{-2}$	0.66	$3.3 \cdot 10^{-3}$	0.97
$2^+(\kappa_q = 2\kappa_g;\ p_T < 125GeV)$	$5.0 \cdot 10^{-2}$	$1.3 \cdot 10^{-2}$	0.88	$3.2 \cdot 10^{-4}$	0.27

High mass H→WW, ZZ in CMS

arXiv:1504.00936, accepted by JHEP



H→WW limits are closed to those obtained by ATLAS

H→WW* in VH-production mode in ATLAS

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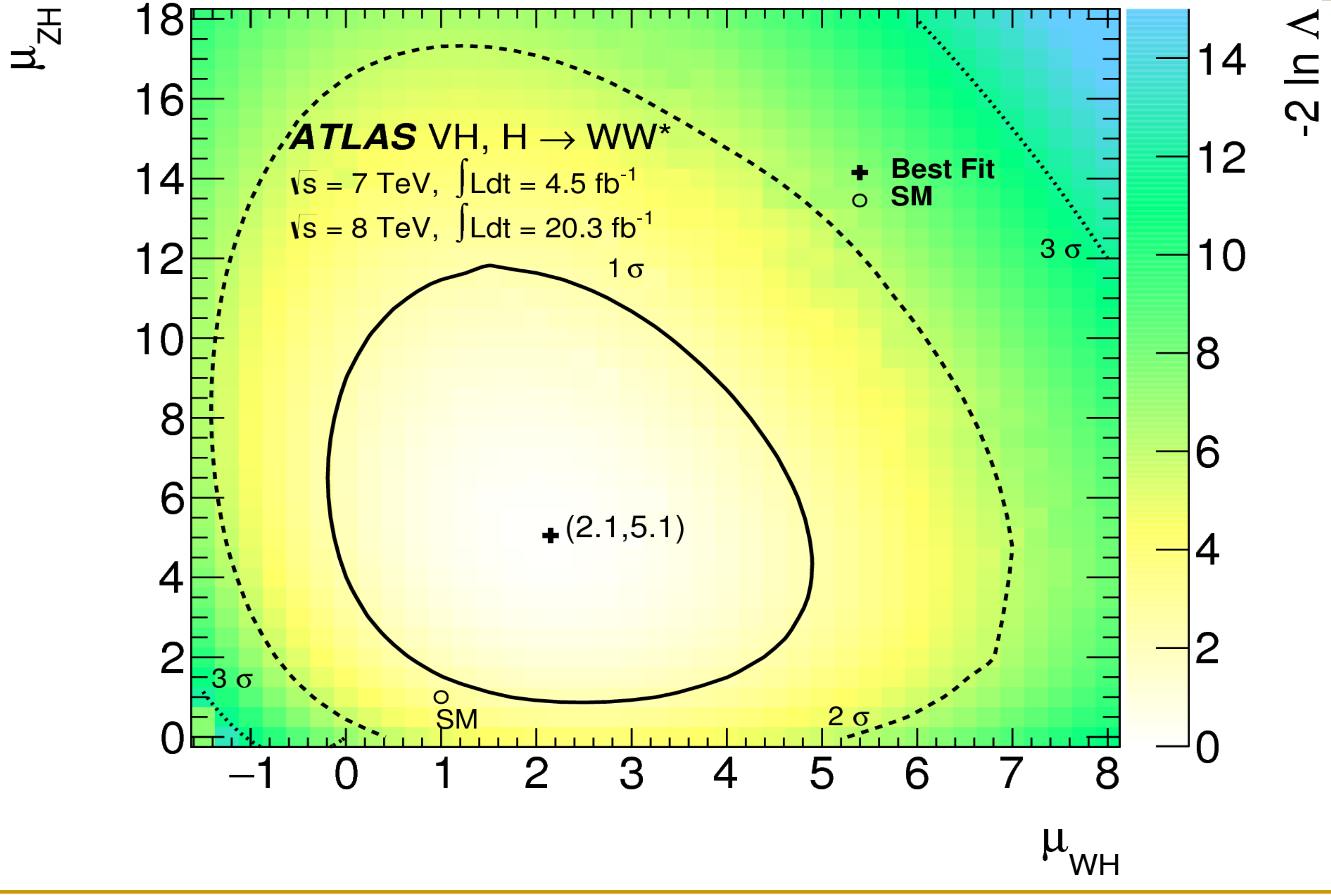
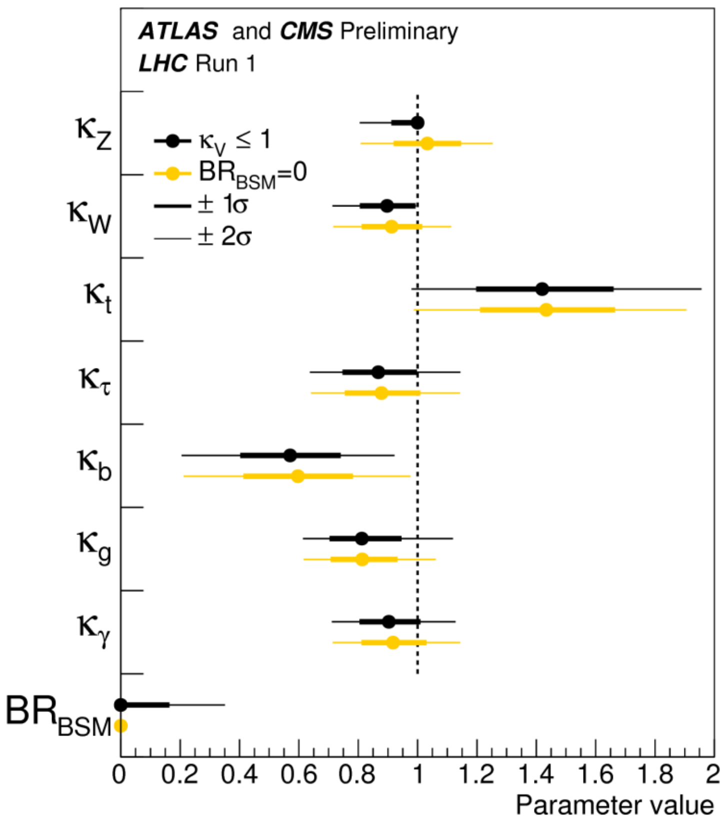
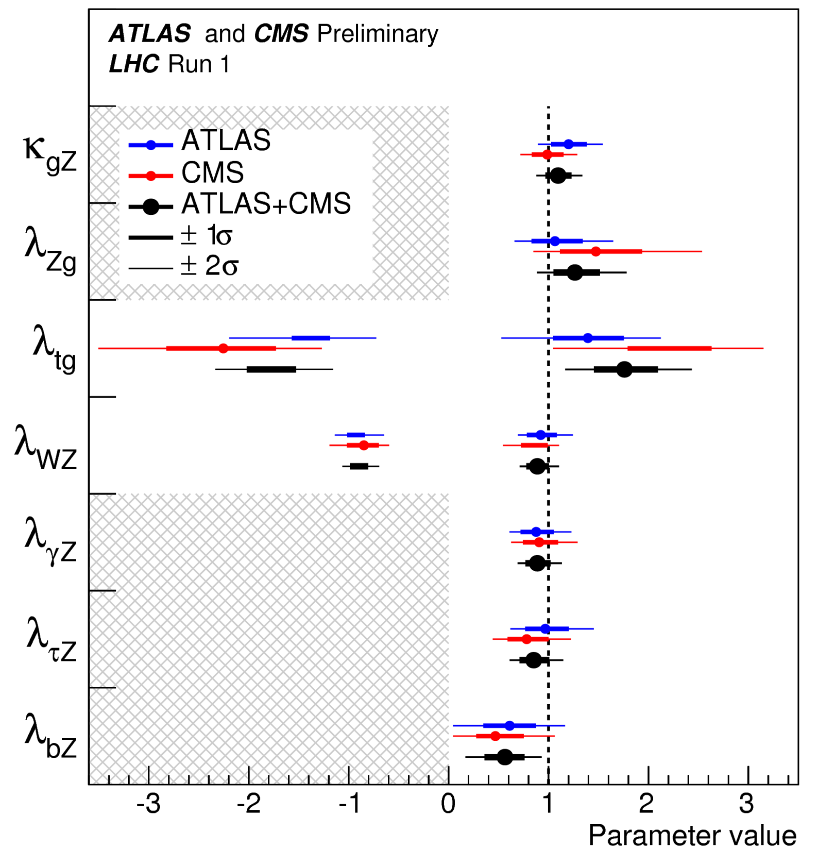
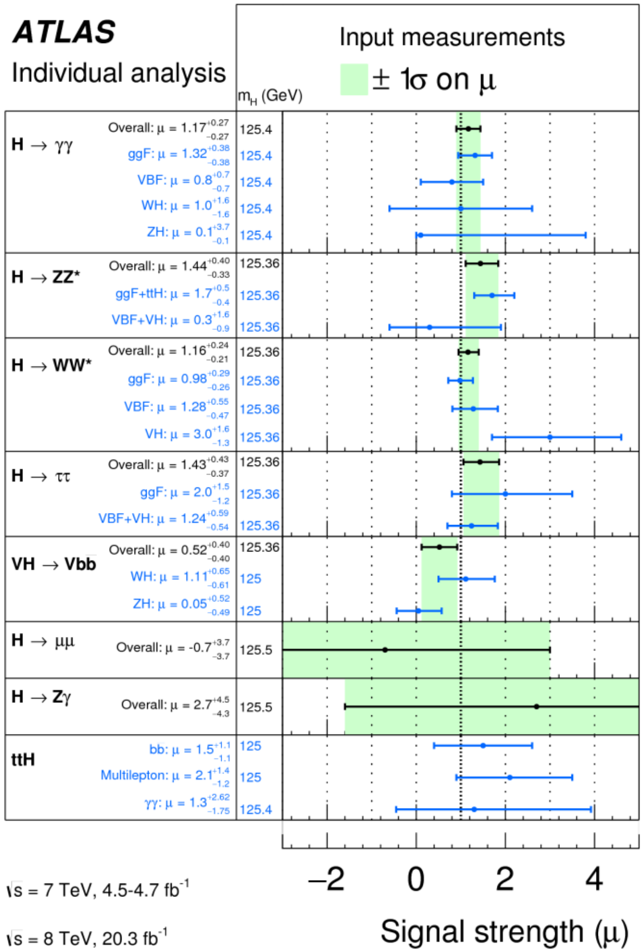


ATLAS+CMS combination: constant modificators

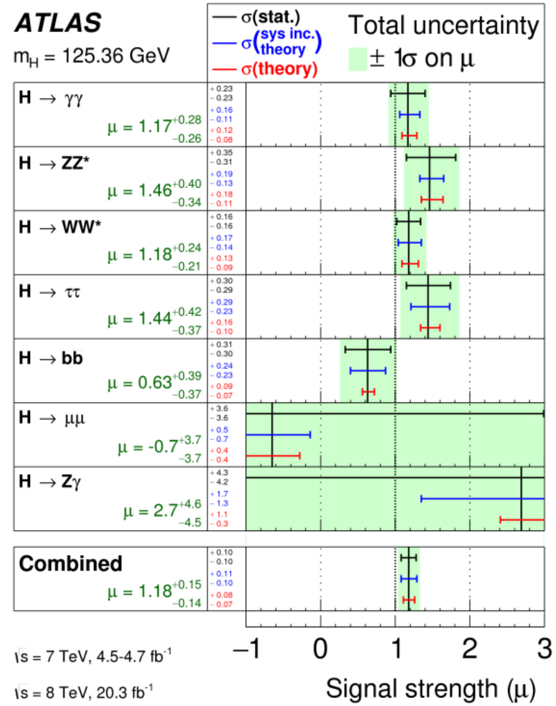


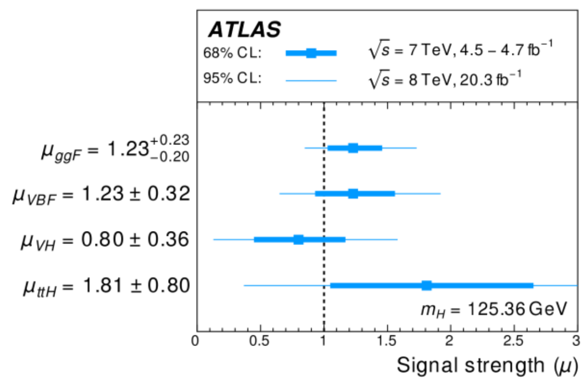


H boson decay rates and couplings: ATLAS only



mH=125.36 GeV
in combination





arXiv:1507.04548, submitted to EPJC

μ=1.18 ± 0.10 (stat.) ± 0.07 (syst.) ± 0.08 (theory)