NODE=S126

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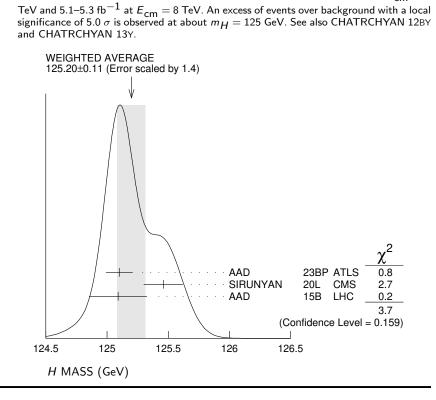
J = 0

In the following H refers to the signal that has been discovered in the Higgs searches. Whereas the observed signal is labeled as a spin 0 particle and is called a Higgs Boson, the detailed properties of Hand its role in the context of electroweak symmetry breaking need to be further clarified. These issues are addressed by the measurements listed below.

Concerning mass limits and cross section limits that have been obtained in the searches for neutral and charged Higgs bosons, see the sections "Searches for Neutral Higgs Bosons" and "Searches for Charged Higgs Bosons $(H^{\pm} \text{ and } H^{\pm \pm})$ ", respectively.

H MASS VALUE (GeV)	DOCUMENT ID TECN COMMENT	NODE=S126M NODE=S126M
125.20±0.11 OUR AVER [125.25 ± 0.17 GeV OUR	RAGE Error includes scale factor of 1.4. See the ideogram below. R 2023 AVERAGE Scale factor $= 1.5$]	NEW
125.10 ± 0.11 125.46 ± 0.16 $125.09 \pm 0.21 \pm 0.11$ • • • We do not use the	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	OCCUR=2
$124.99 \pm 0.18 \pm 0.04$	⁵ AAD 23AU ATLS <i>pp</i> , 13 TeV, $ZZ^* \rightarrow 4\ell$	
$124.99 \pm 0.18 \pm 0.04$ $124.94 \pm 0.17 \pm 0.03$	$\begin{array}{c} \text{AAD} \\ \text{6} \text{ AAD} \\ \text{23AU ATLS} pp, \ 13 \ \text{TeV}, \ 22 \rightarrow 4\ell \\ \text{6} \\ \text{AAD} \\ \text{23AU ATLS} pp, \ 7, \ 8, \ 13 \ \text{TeV}, \ ZZ^* \rightarrow \\ 4\ell \\ \end{array}$	OCCUR=2
125.11 ± 0.11	^{<i>l</i>} AAD 23BP ATLS pp , 7, 8, 13 TeV, $\gamma\gamma$, $77^* \rightarrow 4\ell$	OCCUR=2
$\begin{array}{c} 125.17 \!\pm\! 0.11 \!\pm\! 0.09 \\ 125.22 \!\pm\! 0.11 \!\pm\! 0.09 \end{array}$	⁸ AAD 23BU ATLS pp, 13 TeV, γγ ⁹ AAD 23BU ATLS pp, 7, 8, 13 TeV, γγ	OCCUR=2
$\begin{array}{c} 125.78 \!\pm\! 0.26 \\ 125.38 \!\pm\! 0.14 \end{array}$	$ \begin{array}{llllllllllllllllllllllllllllllllllll$	OCCUR=3
$\begin{array}{c} 124.79 \!\pm\! 0.37 \\ 124.93 \!\pm\! 0.40 \end{array}$	$\begin{array}{ccc} ZZ^* \rightarrow & 4\ell \\ 12 \text{ AABOUD} & 18 \text{BMATLS} & pp, 13 \text{ TeV}, ZZ^* \rightarrow & 4\ell \\ 13 \text{ AABOUD} & 18 \text{BMATLS} & pp, 13 \text{ TeV}, \gamma\gamma \end{array}$	OCCUR=2
124.93 ± 0.40 124.86 ± 0.27	³ AABOUD 18BMATLS pp , 13 TeV, $\gamma\gamma$, $ZZ^* \rightarrow 4\ell$	OCCUR=3
124.00 ± 0.27 124.97 ± 0.24	^{3,14} AABOUD 18BMATLS pp , 7, 8, 13 TeV, $\gamma\gamma$, $ZZ^* \rightarrow 4\ell$	OCCUR=4
$125.26 \pm 0.20 \pm 0.08$	15 SIRUNYAN 17AV CMS pp , 13 TeV, $ZZ^* ightarrow 4\ell$	
$125.07 \pm 0.25 \pm 0.14$	A	OCCUR=2 OCCUR=3
$\begin{array}{c} 125.15 \!\pm\! 0.37 \!\pm\! 0.15 \\ 126.02 \!\pm\! 0.43 \!\pm\! 0.27 \end{array}$		OCCUR=3 OCCUR=4
$120.02 \pm 0.43 \pm 0.27$ $124.51 \pm 0.52 \pm 0.04$	AAD15BATLS pp , 7, 8 TeV, $\gamma\gamma$ AAD15BATLS pp , 7, 8 TeV, $ZZ^* \rightarrow 4\ell$	OCCUR=4 OCCUR=5
$124.51 \pm 0.52 \pm 0.04$ $125.59 \pm 0.42 \pm 0.17$	AAD 15B ATLS $pp, 7, 8$ TeV, $ZZ \rightarrow 4\ell$ AAD 15B CMS $pp, 7, 8$ TeV, $ZZ^* \rightarrow 4\ell$	OCCUR=6
$125.02 \pm 0.42 \pm 0.17$ $125.02 \pm 0.26 \pm 0.14$ -0.27 ± 0.15	¹⁶ KHACHATRY15amCMS pp , 7, 8 TeV	OCCON=0
$125.36 \pm 0.37 \pm 0.18$	^{3,17} AAD 14W ATLS pp, 7, 8 TeV	
$125.98\!\pm\!0.42\!\pm\!0.28$	¹⁷ AAD 14W ATLS pp , 7, 8 TeV, $\gamma\gamma$	OCCUR=2
$124.51\!\pm\!0.52\!\pm\!0.06$	¹⁷ AAD 14W ATLS pp, 7, 8 TeV, $ZZ^* \rightarrow 4\ell$	OCCUR=3
125.6 $\pm 0.4 \pm 0.2$	18 CHATRCHYAN 14AA CMS $$ $$ p p, 7, 8 TeV, $$ $ZZ^* ightarrow $ 4ℓ	
122 ±7	¹⁹ CHATRCHYAN 14κ CMS pp , 7, 8 TeV, $ au au$	
$124.70\!\pm\!0.31\!\pm\!0.15$	20 KHACHATRY14P CMS $$ pp, 7, 8 TeV, $\gamma\gamma$	
$\begin{array}{ccc} 125.5 \ \pm 0.2 \ \begin{array}{c} + 0.5 \\ - 0.6 \end{array}$	^{3,21} AAD 13AK ATLS <i>pp</i> , 7, 8 TeV	
$126.8\ \pm 0.2\ \pm 0.7$	21 AAD 13 AK ATLS $$ pp, 7, 8 TeV, $\gamma\gamma$	OCCUR=2
$124.3 \begin{array}{c} +0.6 \\ -0.5 \end{array} \begin{array}{c} +0.5 \\ -0.3 \end{array}$	$\begin{array}{ccc} 21 \text{ AAD} & 13 \text{AK ATLS} p p, \ 7, \ 8 \ \text{TeV}, \ Z \ Z^* \rightarrow \ 4\ell \end{array}$	OCCUR=3
$125.8\ \pm 0.4\ \pm 0.4$	^{3,22} CHATRCHYAN 13J CMS <i>pp</i> , 7, 8 TeV	
126.2 $\pm 0.6 \pm 0.2$	²² CHATRCHYAN 13J CMS <i>pp</i> , 7, 8 TeV, $ZZ^* \rightarrow 4\ell$	OCCUR=2
$126.0\ \pm 0.4\ \pm 0.4$	^{3,23} AAD 12AI ATLS <i>pp</i> , 7, 8 TeV	
125.3 $\pm 0.4 \pm 0.5$	3,24 CHATRCHYAN 12N CMS pp, 7, 8 TeV	

 $^1\,{\sf AAD}$ 23BP combine 13 TeV results of H \rightarrow $~\gamma\gamma$ (AAD 23BU) and H \rightarrow $~Z\,Z^*$ \rightarrow NODE=S126M;LINKAGE=P 4 ℓ where ℓ = e, μ (AAD 23AU) using 140 fb⁻¹ of pp collision data. The result is $125.10 \pm 0.09(\text{stat}) \pm 0.07(\text{syst})$ GeV. ²SIRUNYAN 20L result of $H \rightarrow \gamma \gamma$ is combined with that of $H \rightarrow ZZ^* \rightarrow 4\ell$ where ℓ NODE=S126M;LINKAGE=K = e, μ (SIRUNYAN 17AV). ³Combined value from $\gamma\gamma$ and $ZZ^* \rightarrow 4\ell$ final states. NODE=S126M;LINKAGE=AA ⁴ATLAS and CMS data are fitted simultaneously. NODE=S126M;LINKAGE=LC 5 AAD 23AU use 139 fb $^{-1}$ of *pp* collisions at $E_{
m cm}=$ 13 TeV with $H o ZZ^* o 4\ell$ NODE=S126M;LINKAGE=N where $\ell = e, \mu$. ⁶AAD 23AU combine 13 TeV results with 7 and 8 TeV results (AAD 14W). NODE=S126M:LINKAGE=O 7 AAD 23BP combine 13 TeV results with 7 and 8 TeV results. The result is 125.11 \pm NODE=S126M;LINKAGE=Q $0.09(stat)\pm0.06(syst)$ GeV. ⁸AAD 23BU use 140 fb⁻¹ of *pp* collisions at $E_{cm} = 13$ TeV with $H \rightarrow \gamma \gamma$. NODE=S126M;LINKAGE=R ⁹AAD 23BU combine 13 TeV results with 7 and 8 TeV results (AAD 15B). NODE=S126M;LINKAGE=S 10 SIRUNYAN 20L use 35.9 fb $^{-1}$ of pp collisions at $E_{\rm cm}$ = 13 TeV with $H \rightarrow ~\gamma\gamma$. NODE=S126M;LINKAGE=J 11 SIRUNYAN 20L combine 13 TeV results with 7 and 8 TeV results (KHACHA-NODE=S126M;LINKAGE=M TRYAN 15AM). 12 AABOUD 18BM use 36.1 fb $^{-1}$ of pp collisions at $E_{\rm cm}$ = 13 TeV with H $\rightarrow~$ ZZ* $\rightarrow~$ NODE=S126M;LINKAGE=G 4ℓ where $\ell = e, \mu$. ¹³AABOUD 18BM use 36.1 fb⁻¹ of *pp* collisions at $E_{\rm cm} =$ 13 TeV with $H \rightarrow \gamma \gamma$. NODE=S126M;LINKAGE=H 14 AABOUD 18BM combine 13 TeV results with 7 and 8 TeV results. Other combined NODE=S126M;LINKAGE=I results are summarized in their Fig. 4. 15 SIRUNYAN 17AV use 35.9 fb $^{-1}$ of pp collisions at $E_{
m cm}=$ 13 TeV with $H
ightarrow ZZ^*
ightarrow$ NODE=S126M;LINKAGE=F 4ℓ where $\ell = e, \mu$. 16 KHACHATRYAN 15AM use up to 5.1 fb $^{-1}$ of pp collisions at $E_{\rm cm}=$ 7 TeV and up to NODE=S126M;LINKAGE=E 19.7 fb⁻¹ at $E_{\rm cm} = 8$ TeV. 17 AAD 14W use 4.5 fb $^{-1}$ of pp collisions at $E_{\rm cm}$ = 7 TeV and 20.3 fb $^{-1}$ at 8 TeV. NODE=S126M;LINKAGE=A 18 CHATRCHYAN 14AA use 5.1 fb⁻¹ of pp collisions at $E_{\rm cm}=$ 7 TeV and 19.7 fb⁻¹ at NODE=S126M;LINKAGE=B $E_{\rm cm} = 8$ TeV. 19 CHATRCHYAN 14K use 4.9 fb $^{-1}$ of pp collisions at $E_{\rm cm} =$ 7 TeV and 19.7 fb $^{-1}$ at NODE=S126M;LINKAGE=D $E_{\rm cm} = 8$ TeV. 20 KHACHATRYAN 14P use 5.1 fb $^{-1}$ of pp collisions at $E_{\rm cm}=$ 7 TeV and 19.7 fb $^{-1}$ at NODE=S126M;LINKAGE=C $E_{\rm cm} = 8$ TeV. ²¹AAD 13AK use 4.7 fb⁻¹ of pp collisions at E_{cm} =7 TeV and 20.7 fb⁻¹ at E_{cm} =8 TeV. NODE=S126M;LINKAGE=LH Superseded by AAD 14W. 22 CHATRCHYAN 13J use 5.1 fb $^{-1}$ of pp collisions at $E_{\rm cm}$ = 7 TeV and 12.2 fb $^{-1}$ at NODE=S126M;LINKAGE=CT $E_{\rm cm} = 8$ TeV. 23 AAD 12AI obtain results based on 4.6–4.8 fb $^{-1}$ of pp collisions at $E_{\rm cm}=$ 7 TeV and NODE=S126M;LINKAGE=AI 5.8–5.9 fb⁻¹ at $E_{\rm cm}$ = 8 TeV. An excess of events over background with a local significance of 5.9 σ is observed at m_H = 126 GeV. See also AAD 12DA. ²⁴CHATRCHYAN 12N obtain results based on 4.9–5.1 fb⁻¹ of pp collisions at $E_{cm} = 7$ NODE=S126M;LINKAGE=CH



H SPIN AND CP PROPERTIES

The observation of the signal in the $\gamma\gamma$ final state rules out the possibility that the discovered particle has spin 1, as a consequence of the Landau-Yang theorem. This argument relies on the assumptions that the decaying particle is an on-shell resonance and that the decay products are indeed two photons rather than two pairs of boosted photons, which each could in principle be misidentified as a single photon.

Concerning distinguishing the spin 0 hypothesis from a spin 2 hypothesis, some care has to be taken in modelling the latter in order to ensure that the discriminating power is actually based on the spin properties rather than on unphysical behavior that may affect the model of the spin 2 state.

Under the assumption that the observed signal consists of a single state rather than an overlap of more than one resonance, it is sufficient to discriminate between distinct hypotheses in the spin analyses. On the other hand, the determination of the *CP* properties is in general much more difficult since in principle the observed state could consist of any admixture of *CP*-even and *CP*-odd components. As a first step, the compatibility of the data with distinct hypotheses of pure *CP*-even and pure *CP*odd states with different spin assignments has been investigated. In order to treat the case of a possible mixing of different *CP* states, certain cross section ratios are considered. Those cross section ratios need to be distinguished from the amount of mixing between a *CP*-even and a *CP*-odd state, as the cross section ratios depend in addition also on the coupling strengths of the *CP*-even and *CP*-odd components to the involved particles. A small relative coupling implies a small sensitivity of the corresponding cross section ratio to effects of *CP* mixing.

DOCUMENT ID TECN COMMENT VALUE • • • We do not use the following data for averages, fits, limits, etc. • • • $^{1}\,\mathrm{AAD}$ 23AK ATLS $H \rightarrow \tau \tau$, 13 TeV 2 AAD 23AN ATLS $H \rightarrow \gamma \gamma$, VBF, 13 TeV ³ TUMASYAN 23AJ CMS $H \rightarrow \tau \tau$, 13 TeV ⁴ TUMASYAN 23P CMS $t\,\overline{t}\,H,\,H
ightarrow\,WW^st,\, au\, au$, 13 TeV 5 aad 22V ATLS $WW^* (\rightarrow e \nu \mu \nu) + 2j$, 13 TeV ⁶ TUMASYAN 22Y CMS H
ightarrow au au, 13 TeV ⁷ AAD 20N ATLS H
ightarrow au au , VBF, 13 TeV ⁸ AAD 20z ATLS $t\,\overline{t}\,H,\,H
ightarrow\,\gamma\gamma$, 13 TeV ⁹ SIRUNYAN 20AS CMS $t\,\overline{t}\,H,\,H
ightarrow\,\gamma\gamma$, 13 TeV ¹⁰ SIRUNYAN 19BL CMS pp, 7, 8, 13 TeV, $ZZ^*/ZZ \rightarrow 4\ell$ ¹¹ SIRUNYAN 19BZ CMS $pp \rightarrow H+2$ jets (VBF, ggF, VH), $H \rightarrow$ $\tau \tau$, 13 TeV ¹² AABOUD 18AJ ATLS $H \rightarrow ZZ^* \rightarrow 4\ell \ (\ell = e, \mu), 13 \text{TeV}$ ¹³ SIRUNYAN 17AM CMS $pp \rightarrow H + \geq 2j, H \rightarrow 4\ell \ (\ell = e, \mu)$ ¹⁴ AAD $H \rightarrow \gamma \gamma$ 16 ATLS $^{15}\,\mathrm{AAD}$ 16BL ATLS $pp \rightarrow HjjX$ (VBF), $H \rightarrow \tau \tau$, 8 TeV ¹⁶ KHACHATRY...16AB CMS $pp \rightarrow WH, ZH, H \rightarrow b\overline{b}, 8 \text{ TeV}$ ¹⁷ AAD 15AX ATLS $H \rightarrow WW^*$ $^{18}\,\mathrm{AAD}$ 15CI ATLS $H \rightarrow ZZ^*, WW^*, \gamma\gamma$ ¹⁹ AALTONEN 15 TEVA $p\overline{p} \rightarrow WH, ZH, H \rightarrow b\overline{b}$ ²⁰ AALTONEN 15B CDF $p\overline{p} \rightarrow WH, ZH, H \rightarrow b\overline{b}$ ²¹ KHACHATRY...15Y CMS $H \rightarrow 4\ell, WW^*, \gamma\gamma$ ²² ABAZOV 14F D0 $p\overline{p} \rightarrow WH, ZH, H \rightarrow b\overline{b}$ 23 CHATRCHYAN 14AA CMS $H \rightarrow ZZ^*$ ²⁴ CHATRCHYAN 14g CMS $H \rightarrow WW^*$ ²⁵ KHACHATRY...14P CMS $H \rightarrow \gamma \gamma$ 26 AAD $H \rightarrow \gamma \gamma, ZZ^* \rightarrow 4\ell, WW^* \rightarrow \ell \nu \ell \nu$ 13AJ ATLS ²⁷ CHATRCHYAN 13J CMS $H \rightarrow ZZ^* \rightarrow 4\ell$

¹ AAD 23AK measure the *CP* structure of the τ Yukawa coupling using 139 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV. The *CP*-mixing angle α for τ Yukawa coupling is measured to be 9 \pm 16°. The data disfavour the pure *CP*-odd ($\alpha = 90^{\circ}$) at 3.4 σ .

²AAD 23AN test *CP* invariance in *H* production via VBF using $H \rightarrow \gamma \gamma$ decay channel with 139 fb⁻¹ at $E_{\rm cm} = 13$ TeV. By using the Optimal Observable method, the data constrain parameters describing the strength of the *CP*-odd component in the coupling between Higgs and W/Z in effective field theory bases: \tilde{d} in the HISZ basis and $c_{H\widetilde{W}}$ in the Warsaw basis. The result is -0.010 $\leq \tilde{d} \leq 0.040$ and -0.15 $\leq c_{H\widetilde{W}} \leq$

0.67 at 68% CL. See their Table I, which shows the result combined with $H \to \tau \tau$ (AAD 20N): -0.012 $\leq \tilde{d} \leq 0.030$ at 68% CL.

NODE=S126CP NODE=S126CP

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NODE=S126CP;LINKAGE=V

NODE=S126CP;LINKAGE=X

 3 TUMASYAN 23AJ constraint anomalous couplings of the Higgs to vector bosons and NODE=S126CP;LINKAGE=W fermions using $pp \rightarrow H \rightarrow \tau \tau$ at $E_{\rm cm} =$ 13 TeV with 138 fb $^{-1}$ data. The CP-violating parameter in gluon-fusion production f_{a3}^{ggH} and the effective mixing angle α^{Hff} are given in their Table VII with $H \rightarrow \tau \tau$ and f_{a3}^{ggH} in their Table X with $H \rightarrow \tau \tau$ and $H \rightarrow 4\ell$. Using the VBF production analysis, the *CP*-violating parameter f_{a3} and the *CP*-conserving parameters f_{a2} , $f_{\Lambda 1}$ and $f_{\Lambda 1}^{Z\gamma}$ are given in their Table VIII with $H \rightarrow \tau \tau$ and Table IX with $H \rightarrow \tau \tau$ and $H \rightarrow 4\ell$. The *CP*-violating parameter f_{CP}^{Htt} is constrained to be $0.03 \stackrel{+}{-} \stackrel{0.17}{-} 0.03$ using $H \rightarrow \tau \tau$, $H \rightarrow 4\ell$ and $H \rightarrow \gamma \gamma$. ⁴ TUMASYAN 23P constrain $\widetilde{\kappa}_t$ from $t \overline{t} H$ and t H decaying $H \to W W^*$ and $H \to \tau \tau$ NODE=S126CP;LINKAGE=Y (multilepton decay mode) with 138 fb^{-1} $\it pp$ collision data at $\it E_{cm}$ = 13 TeV. The $\widetilde{\kappa}_t$ is constrained to be $|\tilde{\kappa}_t| \leq 1.4$ at 95% CL by fixing $\kappa_t = 1$ and other couplings (κ_V etc.) to the SM values, see their Table 6 (see their Fig. 9 for 2-dim contours). The fractional contribution of the CP-odd component $|f_{CP}^{Htt}|$ is constrained to (0.24, 0.81) at 68% CL with a best fit value of 0.59. The combination with other $t \bar{t} H$ decaying $H \rightarrow \gamma \gamma$ (SIRUNYAN 20AS) and $H \rightarrow 4\ell$ (SIRUNYAN 21AE) constraints to be $|\tilde{\kappa}_t| \leq 1.07$ at 95% CL and $|f_{CP}^{Htt}|$ <0.55 at 68% CL with a best fit value of 0.28. 5 AAD 22V measure the CP properties of the effective Higgs-gluon interaction using gluon NODE=S126CP;LINKAGE=U fusion $H \to WW^* \to e\nu\mu\nu$ plus two jets with 36.1 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV. The measured tangent of the CP-mixing angle tan lpha is 0.0 \pm 0.4 \pm 0.3 assuming the standard model HVV couplings. See their Fig. 6. 6 TUMASYAN 22Y measure the $C\!P$ structure of the au Yukawa coupling using 137 fb $^{-1}$ NODE=S126CP;LINKAGE=T of data at $E_{\rm cm} = 13$ TeV. The CP-mixing angle α for τ Yukawa coupling is measured to be $-1 \pm 19^{\circ}$. The data disfavour the pure CP-odd ($\alpha = 90^{\circ}$) at 3.0 σ . 7 AAD 20N test *CP* invariance in *H* production via VBF using H o au au decay channel NODE=S126CP;LINKAGE=Q with 36.1 fb^{-1} at ${\it E_{\rm cm_{\sim}}}=$ 13 TeV. By using the Optimal Observable method, the data constrain a parameter \tilde{d} , which is for the strength of CP violation in an effective field theory, to be $-0.090 \leq \tilde{d} \leq 0.035$ at 68% CL (see their Fig. 6). 8 AAD 20Z exclude a *CP*-mixing angle $lpha, \, |lpha|\, >$ 43 $^{\circ}$ at 95% CL, where lpha= 0 represents NODE=S126CP;LINKAGE=S the Standard Model, in 139 fb $^{-1}$ of data at $E_{\rm cm}=$ 13 TeV. The pure *CP*-odd structure of the top Yukawa coupling ($\alpha = 90^{\circ}$) is excluded at 3.9 σ . 9 SIRUNYAN 20AS exclude the pure *CP*-odd structure of the top Yukawa coupling at 3.2 σ NODE=S126CP;LINKAGE=R using $t\bar{t}H$, $H \rightarrow \gamma\gamma$ in 137 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV. The fractional contribution of the CP-odd component $f_{CP}^{t\,\overline{t}\,H}$ is measured to be 0.00 \pm 0.33. 10 SIRUNYAN 19BL measure the anomalous HVV couplings from on-shell and off-shell NODE=S126CP:LINKAGE=P production in the 4ℓ final state. Data of 80.2 fb⁻¹ at 13 TeV, 19.7 fb⁻¹ at 8 TeV, and 5.1 fb⁻¹ at 7 TeV are used. See their Tables VI and VII for anomalous HVV couplings of CP-violating and CP-conserving parameters with on- and off-shells. 11 SIRUNYAN 19BZ constrain anomalous HVV couplings of the Higgs boson with data of NODE=S126CP;LINKAGE=O 35.9 fb⁻¹ at $E_{\rm cm} = 13$ TeV using Higgs boson candidates with two jets produced in VBF, ggF, and VH that decay to $\tau\tau$. See their Table 2 and Fig. 10, which show 68% CL and 95% CL intervals. Combining those with the $H \rightarrow 4\ell$ (SIRUNYAN 19BL, on-shell scenario), results shown in their Tables 3, 4, and Fig. 11 are obtained. A CP-violating parameter is set to be $f_{a3}\cos(\phi_{a3}) = (0.00 \pm 0.27) \times 10^{-3}$ and *CP*-conserving parameters are $f_{a2}\cos(\phi_{a2}) = (0.08 + 1.04) \times 10^{-3}$, $f_{\Lambda 1}\cos(\phi_{\Lambda 1}) = (0.00 + 0.53) \times 10^{-3}$, and $f_{\Lambda 1}^{Z\gamma}\cos(\phi_{\Lambda 1}^{Z\gamma}) = (0.0 + 1.1) \times 10^{-3}$. $^{12}\,{\rm AABOUD}$ 18AJ study the tensor structure of the Higgs boson couplings using an effective NODE=S126CP;LINKAGE=N Lagrangian using 36.1 fb⁻¹ of pp collision data at $E_{cm} = 13$ TeV. Constraints are set on the non-Standard-Model *CP*-even and *CP*-odd couplings to *Z* bosons and on the CP-odd coupling to gluons. See their Figs. 9 and 10, and Tables 10 and 11. 13 SIRUNYAN 17AM constrain anomalous couplings of the Higgs boson with 5.1 fb $^{-1}$ of NODE=S126CP;LINKAGE=M pp collisions at $E_{\rm CM} = 7$ TeV, 19.7 fb⁻¹ at $E_{\rm CM} = 8$ TeV, and 38.6 fb⁻¹ at $E_{\rm CM} = 13$ TeV. See their Table 3 and Fig. 3, which show 68% CL and 95% CL intervals. A *CP* violation parameter f_{a3} is set to be $f_{a3}\cos(\phi_{a3}) = [-0.38, 0.46]$ at 95% CL ($\phi_{a3} = 0$ or π). 14 AAD 16 study $H \rightarrow ~\gamma \gamma$ with an effective Lagrangian including $C\!P$ even and odd terms in NODE=S126CP;LINKAGE=J 20.3 fb⁻¹ of *pp* collisions at $E_{\rm cm} = 8$ TeV. The data is consistent with the expectations for the Higgs boson of the Standard Model. Limits on anomalous couplings are also given. 15 AAD 16BL study VBF H
ightarrow au au with an effective Lagrangian including a CP odd term NODE=S126CP;LINKAGE=L in 20.3 fb⁻¹ of pp collisions at $E_{\rm cm}$ = 8 TeV. The measurement is consistent with the expectation of the Standard Model. The CP-mixing parameter \tilde{d} (a dimensionless coupling $\tilde{d} = -(m_W^2/\Lambda^2) f_{\widetilde{W}W}$ is constrained to the interval of (-0.11, 0.05) at 68% CL under the assumption of $d = d_B$. $^{16}\,\rm KHACHATRYAN$ 16AB search for anomalous pseudoscalar couplings of the Higgs boson NODE=S126CP;LINKAGE=K to W and Z with 18.9 fb⁻¹ of pp collisions at $E_{cm} = 8$ TeV. See their Table 5 and

Figs 5 and 6 for limits on possible anomalous pseudoscalar coupling parameters.

 17 AAD 15AX compare the $J^{CP}=0^+$ Standard Model assignment with other J^{CP} hy-NODE=S126CP;LINKAGE=F potheses in 20.3 fb^{-1} of pp collisions at $E_{
m cm}$ = 8 TeV, using the process H ightarrow $WW^* \rightarrow e\nu\mu\nu$. 2⁺ hypotheses are excluded at 84.5–99.4%CL, 0⁻ at 96.5%CL, 0^+ (field strength coupling) at 70.8%CL. See their Fig. 19 for limits on possible CP mixture parameters. ¹⁸AAD 15CI compare the $J^{CP} = 0^+$ Standard Model assignment with other J^{CP} hypothe-NODE=S126CP;LINKAGE=G ses in 4.5 fb⁻¹ of pp collisions at $E_{cm} = 7$ TeV and 20.3 fb⁻¹ at $E_{cm} = 8$ TeV, using the processes $H \rightarrow ZZ^* \rightarrow 4\ell$. $H \rightarrow \gamma\gamma$ and combine with AAD 15AX data. 0⁺ (field strength coupling), 0^- and several 2^+ hypotheses are excluded at more than 99.9% CL. See their Tables 7–9 for limits on possible CP mixture parameters. $^{19}\,\mathrm{AALTONEN}$ 15 combine AALTONEN 15B and ABAZOV 14F data. An upper limit of NODE=S126CP;LINKAGE=E 0.36 of the Standard Model production rate at 95% CL is obtained both for a 0 $^-$ and a 2^+ state. Assuming the SM event rate, the $J^{CP} = 0^- (2^+)$ hypothesis is excluded at the 5.0 σ (4.9 σ) level. ²⁰ AALTONEN 15B compare the $J^{CP} = 0^+$ Standard Model assignment with other J^{CP} NODE=S126CP;LINKAGE=D hypotheses in 9.45 fb $^{-1}$ of $p\overline{p}$ collisions at $E_{
m cm}=$ 1.96 TeV, using the processes ZH ightarrow $\ell\ell b\overline{b}, WH \rightarrow \ell\nu b\overline{b}$, and $ZH \rightarrow \nu\nu b\overline{b}$. Bounds on the production rates of 0⁻ and 2^+ (graviton-like) states are set, see their tables II and III. ²¹KHACHATRYAN 15Y compare the $J^{CP} = 0^+$ Standard Model assignment with other NODE=S126CP;LINKAGE=I J^{CP} hypotheses in up to 5.1 fb⁻¹ of pp collisions at $E_{\rm cm}$ = 7 TeV and up to 19.7 fb⁻¹ at $E_{\rm cm} = 8$ TeV, using the processes $H \rightarrow 4\ell$, $H \rightarrow WW^*$, and $H \rightarrow \gamma \gamma$. 0⁻ is excluded at 99.98% CL, and several 2^+ hypotheses are excluded at more than 99% CL. Spin 1 models are excluded at more than 99.999% CL in ZZ^* and WW^* modes. Limits on anomalous couplings and several cross section fractions, treating the case of CP-mixed states, are also given. ²²ABAZOV 14F compare the $J^{CP} = 0^+$ Standard Model assignment with $J^{CP} = 0^-$ and NODE=S126CP;LINKAGE=AB 2^+ (graviton-like coupling) hypotheses in up to 9.7 fb⁻¹ of $p\bar{p}$ collisions at $E_{\rm cm} = 1.96$ TeV. They use kinematic correlations between the decay products of the vector boson and the Higgs boson in the final states $ZH \rightarrow \ell\ell b\bar{b}$, $WH \rightarrow \ell\nu b\bar{b}$, and $ZH \rightarrow \ell$ $\nu\nu b \overline{b}$. The 0⁻ (2⁺) hypothesis is excluded at 97.6% CL (99.0% CL). In order to treat the case of a possible mixture of a 0⁺ state with another J^{CP} state, the cross section fractions $f_X = \sigma_X/(\sigma_{0+} + \sigma_X)$ are considered, where $X = 0^-$, 2⁺. Values for f_{0-} (f_{2+}) above 0.80 (0.67) are excluded at 95% CL under the assumption that the total cross section is that of the SM Higgs boson. ²³ CHATRCHYAN 14AA compare the $J^{CP} = 0^+$ Standard Model assignment with various NODE=S126CP;LINKAGE=A J^{CP} hypotheses in 5.1 fb⁻¹ of pp collisions at $E_{cm} = 7$ TeV and 19.7 fb⁻¹ at E_{cm} The second state of the s ²⁴CHATRCHYAN 14G compare the $J^{CP} = 0^+$ Standard Model assignment with $J^{CP} =$ NODE=S126CP:LINKAGE=C 0^- and 2^+ (graviton-like coupling) hypotheses in 4.9 fb⁻¹ of pp collisions at $E_{\rm cm} =$ 7 TeV and 19.4 fb $^{-1}$ at $E_{\rm cm}$ = 8 TeV. Varying the fraction of the production of the 2^+ state via g g and $q \overline{q}$, 2^+ hypotheses are disfavored at CL between 83.7 and 99.8%. The 0^- hypothesis is disfavored against 0^+ at the 65.3% CL. 25 KHACHATRYAN 14P compare the $J^{CP} = 0^+$ Standard Model assignment with a 2+ NODE=S126CP;LINKAGE=B (graviton-like coupling) hypothesis in 5.1 fb⁻¹ of pp collisions at $E_{\rm cm}$ = 7 TeV and 19.7 fb⁻¹ at $E_{\rm cm}$ = 8 TeV. Varying the fraction of the production of the 2⁺ state via gg and $q\overline{q}$, 2⁺ hypotheses are disfavored at CL between 71 and 94%. 26 AAD 13AJ compare the spin 0, *CP*-even hypothesis with specific alternative hypotheses NODE=S126CP;LINKAGE=AA of spin 0, CP-odd, spin 1, CP-even and CP-odd, and spin 2, CP-even models using the Higgs boson decays $H \rightarrow \gamma \gamma$, $H \rightarrow ZZ^* \rightarrow 4\ell$ and $H \rightarrow WW^* \rightarrow \ell \nu \ell \nu$ and combinations thereof. The data are compatible with the spin 0, CP-even hypothesis, while all other tested hypotheses are excluded at confidence levels above 97.8%. $^{27}\,\rm CHATRCHYAN$ 13J study angular distributions of the lepton pairs in the ZZ^* channel NODE=S126CP;LINKAGE=CH where both Z bosons decay to e or μ pairs. Under the assumption that the observed particle has spin 0, the data are found to be consistent with the pure CP-even hypothesis, while the pure CP-odd hypothesis is disfavored. **H DECAY WIDTH** NODE=S126W NODE=S126W

The total decay width for a light Higgs boson with a mass in the observed range is not expected to be directly observable at the LHC. For the case of the Standard Model the prediction for the total width is about 4 MeV, which is three orders of magnitude smaller than the experimental mass resolution. There is no indication from the results observed so far that the natural width is broadened by new physics effects to such an

extent that it could be directly observable. Furthermore, as all LHC Higgs channels rely on the identification of Higgs decay products, the total Higgs width cannot be measured indirectly without additional assumptions. The different dependence of on-peak and off-peak contributions on the total width in Higgs decays to ZZ^* and interference effects between signal and background in Higgs decays to $\gamma\gamma$ can provide additional information in this context. Constraints on the total width from the combination of on-peak and off-peak contributions in Higgs decays to ZZ^* rely on the assumption of equal on- and off-shell effective couplings. Without an experimental determination of the total width or further theoretical assumptions, only ratios of couplings can be determined at the LHC rather than absolute values of couplings.

VALUE (MeV)	<u>CL%</u>	DOCUMENT ID	TECN	COMMENT	NODE=S126W
3.7 ^{+1.9} O	ur avei	RAGE			
[3.2 ^{+2.4} _{-1.7} MeV O					NEW
$4.5^{+3.3}_{-2.5}$		¹ AAD	23BR ATLS	pp, 13 TeV, $ZZ^*/ZZ \rightarrow 4\ell, ZZ \rightarrow 2\ell 2\nu$	
$3.2^{+2.4}_{-1.7}$		² TUMASYAN	22AM CMS	pp, 13 TeV, $ZZ^*/ZZ ightarrow 4\ell, ZZ ightarrow 2\ell 2 u$	
$\bullet \bullet \bullet$ We do not	use the	following data for av	verages, fits, li		
$3.2^{+2.8}_{-2.2}$		³ SIRUNYAN	19BL CMS	<i>pp</i> , 7, 8, 13 TeV, <i>ZZ</i> * / <i>ZZ</i> → 4ℓ	
< 14.4	95	⁴ AABOUD	18bp ATLS	pp , 13 TeV, $ZZ \rightarrow 4\ell$, $2\ell 2\nu$	
<1100	95	⁵ SIRUNYAN	17AV CMS	<i>pp</i> , 13 TeV, $ZZ^* \rightarrow 4\ell$	
< 26	95	⁶ KHACHATRY	16BA CMS	рр, 7, 8 TeV, <i>WW</i> (*)	
< 13	95			<i>pp</i> , 7, 8 TeV, $ZZ^{(*)}$, $WW^{(*)}$	OCCUR=2
< 22.7	95	⁸ AAD	15be ATLS	<i>pp</i> , 8 TeV, <i>ZZ</i> ^(*) , <i>WW</i> ^(*)	
<1700	95	⁹ KHACHATRY	15AM CMS	<i>pp</i> , 7, 8 TeV	
$>$ 3.5 $ imes$ 10 $^{-9}$	95			<i>pp</i> , 7, 8 TeV, flight distance	
< 46	95	¹¹ KHACHATRY	15BA CMS	pp, 7, 8 TeV, $ZZ^{(*)} \rightarrow 4\ell$	OCCUR=2
<5000	95	¹² AAD	14W ATLS	<i>pp</i> , 7, 8 TeV, $\gamma\gamma$	
<2600	95	¹² AAD	14W ATLS	pp , 7, 8 TeV, $ZZ^* \rightarrow 4\ell$	OCCUR=2
<3400	95	¹³ CHATRCHYA	N 14AA CMS	pp, 7, 8 TeV, $ZZ^* \rightarrow 4\ell$	
< 22	95	¹⁴ KHACHATRY	14D CMS	<i>рр</i> , 7, 8 TeV, <i>ZZ</i> (*)	
<2400	95	¹⁵ KHACHATRY	14P CMS	pp, 7, 8 TeV, $\gamma\gamma$	
the $ZZ \rightarrow A$	4ℓ and 2	$ZZ ightarrow 2\ell 2 u$ decay	channels and	shell Higgs boson production in the on-shell production in the are used to measure the total	NODE=S126W;LINKAGE=N

The ZZ $\rightarrow 4\epsilon$ and ZZ $\rightarrow 2\epsilon 2\nu$ decay channels and the on-shell production in the $ZZ^* \rightarrow 4\ell$ ($\ell = e, \mu$, AAD 20AQ) decay channels are used to measure the total width. The off-shell Higgs signal strength is measured to be $1.1 \substack{+0.7 \\ -0.6}$ assuming the same on-shell and off-shell coupling modifiers are used individually for gluon-fusion and for gauge-boson modes. The scenario of no off-shell contribution is excluded at 3.3 σ . Combining with the on-shell signal strength measurement, the total width normalized to its SM expectation Γ_H / Γ_H^{SM} is measured to be $1.1 \substack{+0.7 \\ -0.6}$ assuming the same on-shell and off-shell coupling modifiers are used individually for gluon-fusion and for gauge-boson modes. The observed upper limit on the total width is 10.5 MeV at 95% CL. See their Fig. 7.

- ² TUMASYAN 22AM use up to 140 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The off-shell Higgs boson production in the $ZZ \rightarrow 4\ell$ and $ZZ \rightarrow 2\ell 2\nu$ decay channels and the on-shell production in the $ZZ^* \rightarrow 4\ell$ ($\ell = e, \mu$) decay channels are used to measure the total width. The off-shell Higgs signal strength is measured to be $0.62^{+0.68}_{-0.45}$ without the constraint on the ratio of the off-shell signal strengths for gluon-fusion and gauge-boson modes. The scenario of no off-shell contribution is excluded at 3.6 σ . The results are shown in their Table 1 with other constraint scenarios and the decay widths assuming the same coupling modifiers for on- and off-shell couplings (g_p and g_d in their notation). The measurement of anomalous HVV couplings is shown in their Extended Data Table 1 and Fig. 8.
- ³ SIRUNYAN 19BL measure the width and anomalous HVV couplings from on-shell and off-shell production in the 4 ℓ final state. Data of 80.2 fb⁻¹ at 13 TeV, 19.7 fb⁻¹ at 8 TeV, and 5.1 fb⁻¹ at 7 TeV are used. The total width for the SM-like couplings is measured to be also [0.08, 9.16] MeV with 95% CL, assuming SM-like couplings for on-and off-shells (see their Table VIII). Constraints on the total width for anomalous HVV interaction cases are found in their Table IX. See their Table X for the Higgs boson signal strength in the off-shell region.
- ⁴ AABOUD 18BP use 36.1 fb⁻¹ at $E_{\rm cm} = 13$ TeV. An observed upper limit on the off-shell Higgs signal strength of 3.8 is obtained at 95% CL using off-shell Higgs boson production in the $ZZ \rightarrow 4\ell$ and $ZZ \rightarrow 2\ell 2\nu$ decay channels ($\ell = e, \mu$). Combining with the on-shell signal strength measurements, the quoted upper limit on the Higgs boson total width is obtained, assuming the ratios of the relevant Higgs-boson couplings to the SM predictions are constant with energy from on-shell production to the high-mass range.

NODE=S126W;LINKAGE=K

NODE=S126W;LINKAGE=L

NODE=S126W;LINKAGE=M

- 5 SIRUNYAN 17AV obtain an upper limit on the width from the $m_{4\ell}$ distribution in $ZZ^* o$ 4ℓ ($\ell = e, \mu$) decays. Data of 35.9 fb⁻¹ pp collisions at $E_{cm} = 13$ TeV is used. The expected limit is 1.60 GeV.
- ⁶KHACHATRYAN 16BA derive constraints on the total width from comparing $WW^{(*)}$ production via on-shell and off-shell H using 4.9 fb⁻¹ of pp collisions at $E_{cm} = 7$ TeV and 19.4 fb⁻¹ at 8 TeV. 7 KHACHATRYAN 16BA combine the $WW^{(*)}$ result with $ZZ^{(*)}$ results of KHACHA-
- TRYAN 15BA and KHACHATRYAN 14D.
- ⁸AAD 15BE derive constraints on the total width from comparing $ZZ^{(*)}$ and $WW^{(*)}$ production via on-shell and off-shell H using 20.3 fb⁻¹ of pp collisions at $E_{\rm cm} = 8$ TeV. The K factor for the background processes is assumed to be equal to that for the signal. ⁹ KHACHATRYAN 15AM combine $\gamma\gamma$ and $ZZ^* \rightarrow 4\ell$ results. The expected limit is 2.3
- GeV.
- $^{10}\,\mathrm{KHACHATRYAN}$ 15BA derive a lower limit on the total width from an upper limit on the decay flight distance $\tau < 1.9 \times 10^{-13}$ s. 5.1 fb⁻¹ of pp collisions at $E_{\rm cm} = 7$
- TeV and 19.7 fb⁻¹ at 8 TeV are used. ¹¹KHACHATRYAN 15BA derive constraints on the total width from comparing $ZZ^{(*)}$ production via on-shell and off-shell H with an unconstrained anomalous coupling. 4ℓ final states in 5.1 fb⁻¹ of pp collisions at $E_{cm} = 7$ TeV and 19.7 fb⁻¹ at $E_{cm} = 8$ TeV are used.
- ¹² AAD 14W use 4.5 fb⁻¹ of pp collisions at $E_{\rm cm} = 7$ TeV and 20.3 fb⁻¹ at 8 TeV. The expected limit is 6.2 GeV.
- ¹³ CHATRCHYAN 14AA use 5.1 fb⁻¹ of pp collisions at $E_{cm} = 7$ TeV and 19.7 fb⁻¹ at $E_{cm} = 8$ TeV. The expected limit is 2.8 GeV.
- ¹⁴KHACHATRYAN 14D derive constraints on the total width from comparing $ZZ^{(*)}$ production via on-shell and off-shell H. 4 ℓ and $\ell\ell\nu\nu$ final states in 5.1 fb⁻¹ of pp collisions at $E_{\rm cm} = 7$ TeV and 19.7 fb⁻¹ at $E_{\rm cm} = 8$ TeV are used. ¹⁵ KHACHATRYAN 14P use 5.1 fb⁻¹ of pp collisions at $E_{\rm cm} = 7$ TeV and 19.7 fb⁻¹ at

 $E_{\rm cm} = 8$ TeV. The expected limit is 3.1 GeV.

H DECAY MODES

	Mode	Fraction (Γ_i/Γ) Confidence level	
	$WW^{*} ZZ^{*} Y^{\gamma} DD DD$	$\begin{array}{c} (25.7 \pm 2.5) \% \\ (2.80 \pm 0.30) \% \\ (2.50 \pm 0.20) \times 10^{-3} \\ (53 \pm 8) \% \\ < 3.0 \qquad \times 10^{-4} \qquad 95\% \\ (2.6 \pm 1.3) \times 10^{-4} \\ (6.0 \stackrel{+0.8}{-0.7}) \% \\ (3.4 \pm 1.1) \times 10^{-3} \\ < 1.21 \qquad \% \qquad 95\% \\ < 3.6 \qquad \times 10^{-3} \qquad 95\% \end{array}$	DESIG=1 DESIG=2 DESIG=3 DESIG=4 DESIG=10 DESIG=8 DESIG=5 DESIG=6 DESIG=25 DESIG=26
$ \begin{bmatrix} \Gamma_{10} \\ \Gamma_{11} \\ \Gamma_{12} \\ \Gamma_{13} \\ \Gamma_{14} \\ \Gamma_{15} \\ \Gamma_{16} \\ \Gamma_{17} \\ \Gamma_{18} \\ \Gamma_{19} \\ \Gamma_{20} \\ \Gamma_{21} \\ \Gamma_{22} \\ \Gamma_{23} \\ \Gamma_{24} \\ \Gamma_{25} \\ \Gamma_{26} \\ \Gamma_{27} \\ \Gamma_{28} \\ \Gamma_{29} \\ \Gamma_{30} \\ \Gamma_{31} \\ \Gamma_{32} \end{bmatrix} $	$Z \phi(1020)$ $Z \eta_c$ $Z J/\psi$ $Z \psi(2S)$ $J/\psi \gamma$ $J/\psi J/\psi$ $\psi(2S) \gamma$ $\psi(2S) \psi(2S)$ $T(1S) \gamma$ $T(1S) T(1S)$ $T(2S) \gamma$ $T(3S) \gamma$ $T(nS) T(mS)$ $\rho(770) \gamma$ $\omega(782) \gamma$ $K^*(892) \gamma$ $\phi(1020) \gamma$ $e\mu$ $e\tau$ $\mu\tau$ invisible γ invisible	$< 3.6 \times 10^{-3} 95\%$ $< 1.9 \times 10^{-3} 95\%$ $< 6.6 \times 10^{-3} 95\%$ $< 2.0 \times 10^{-4} 95\%$ $< 3.8 \times 10^{-4} 95\%$ $< 1.05 \times 10^{-3} 95\%$ $< 2.1 \times 10^{-3} 95\%$ $< 2.1 \times 10^{-3} 95\%$ $< 3.0 \times 10^{-3} 95\%$ $< 2.5 \times 10^{-4} 95\%$ $< 1.7 \times 10^{-3} 95\%$ $< 4.2 \times 10^{-4} 95\%$ $< 3.4 \times 10^{-4} 95\%$ $< 3.5 \times 10^{-4} 95\%$ $< 3.5 \times 10^{-4} 95\%$ $< 5.5 \times 10^{-4} 95\%$ $< 1.04 \times 10^{-3} 95\%$ $< 5.5 \times 10^{-4} 95\%$ $< 5.5 \times 10^{-4} 95\%$ $< 5.5 \times 10^{-4} 95\%$ $< 1.04 \times 10^{-3} 95\%$ $< 1.04 \times 10^{-3} 95\%$ $< 1.04 \times 10^{-3} 95\%$ $< 2.2 \times 10^{-4} 95\%$ $< 5.5 \times 10^{-4} 95\%$ $< 5.5 \times 10^{-4} 95\%$ $< 2.9 \times 10^{-3} 95\%$	DESIG=26 DESIG=27 DESIG=27 DESIG=29 DESIG=29 DESIG=20 DESIG=30 DESIG=30 DESIG=31 DESIG=12 DESIG=12 DESIG=13 DESIG=14 DESIG=23 DESIG=19 DESIG=34 DESIG=17 DESIG=17 DESIG=17 DESIG=7 DESIG=24

NODE=S126W;LINKAGE=J

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NODE=S126W:LINKAGE=G

NODE=S126W;LINKAGE=D

NODE=S126W;LINKAGE=E

NODE=S126W;LINKAGE=F

NODE=S126W;LINKAGE=AA

NODE=S126W;LINKAGE=B

NODE=S126W;LINKAGE=A

NODE=S126W;LINKAGE=C

NODE=S126220:NODE=S126

H BRANCHING RATIOS

Γ(WW [*])/Γ _{total}					Γ_1/Γ
VALUE	DOCUMENT ID		TECN	COMMENT	
0.257 ^{+0.026} -0.024	¹ ATLAS	22	ATLS	<i>рр</i> , 13 ТеV	

 $^1\,{\rm ATLAS}$ 22 report combined results (see their Extended Data Table 1) using up to 139 $\rm fb^{-1}$ of data at $E_{\rm CM}=13$ TeV, assuming $m_{H}=125.09$ GeV. SM values for the production cross-sections are assumed. See their Fig. 2b.

$\Gamma(ZZ^*)/\Gamma_{total}$					Γ_2/Γ
VALUE	DOCUMENT ID		TECN	COMMENT	
0.028±0.003	¹ ATLAS	22	ATLS	<i>рр</i> , 13 ТеV	

 $^1\mathrm{ATLAS}$ 22 report combined results (see their Extended Data Table 1) using up to 139 $\rm fb^{-1}$ of data at $E_{\rm cm}=13$ TeV, assuming $m_H=125.09$ GeV. SM values for the production cross-sections are assumed. See their Fig. 2b.

$\Gamma(\gamma\gamma)/\Gamma_{total}$					Г ₃ /Г
VALUE	DOCUMENT ID		TECN	COMMENT	
0.0025 ± 0.0002	¹ ATLAS	22	ATLS	<i>рр</i> , 13 ТеV	

 1 ATLAS 22 report combined results (see their Extended Data Table 1) using up to 139 $\rm fb^{-1}$ of data at $E_{\rm cm}=13$ TeV, assuming $m_{H}=125.09$ GeV. SM values for the production cross-sections are assumed. See their Fig. 2b.

$\Gamma(b\overline{b})/\Gamma_{\text{total}}$					Г₄/Г
VALUE	DOCUMENT ID		TECN	COMMENT	
0.53±0.08	¹ ATLAS	22	ATLS	<i>рр</i> , 13 ТеV	

 1 ATLAS 22 report combined results (see their Extended Data Table 1) using up to 139 $\rm fb^{-1}$ of data at $E_{\rm cm}=$ 13 TeV, assuming $m_{H}=$ 125.09 GeV. SM values for the production cross-sections are assumed. See their Fig. 2b.

\ *i*=

- / 1

$\Gamma(e^+e^-)/\Gamma_{total}$		Γı	5/Г			
VALUE	<u>CL%</u>	DOCUMENT ID TECN COMMENT				
$<3.0 \times 10^{-4}$ (CL =	95%) [<3	$.6 imes 10^{-4}$ (CL = 95%) OUR 2023 BEST LIMIT]				
<3.0 × 10 ⁻⁴	95	¹ TUMASYAN 23AU CMS рр, 13 TeV				
\bullet \bullet \bullet We do not use	the followin	g data for averages, fits, limits, etc. 🔹 🔹				
$< 3.6 imes 10^{-4}$	95	² AAD 20F ATLS <i>pp</i> , 13 TeV ³ KHACHATRY15H CMS <i>pp</i> , 7, 8 TeV				
$< 1.9 imes 10^{-3}$	95	³ КНАСНАТRY15н CMS <i>рр</i> , 7, 8 TeV				
¹ TUMASYAN 23A	U use 138 fb	p^{-1} of pp collisions at $E_{ m cm}=13$ TeV.				
		p collisions at $E_{\rm cm} = 13$ TeV. The best-fit value of	the -			
$H \rightarrow ee$ branching fraction is $(0.0 \pm 1.7 \pm 0.6) \times 10^{-4}$ for $m_H = 125$ GeV.						
³ KHACHATRYAN 15H use 5.0 fb ⁻¹ of pp collisions at $E_{cm} = 7$ TeV and 19.7 fb ⁻¹ at 8 TeV.						

$\Gamma(\mu^+\mu^-)/\Gamma_{ ext{total}}$					Г _б /Г
VALUE (units 10 ⁻⁴)	DOCUMENT ID		TECN	COMMENT	
2.6±1.3	¹ ATLAS	22	ATLS	<i>рр</i> , 13 ТеV	
				- · · · · ·	

 $^1\,\text{ATLAS}$ 22 report combined results (see their Extended Data Table 1) using up to 139 $\rm fb^{-1}$ of data at $E_{\rm cm}=13$ TeV, assuming $m_H=125.09$ GeV. SM values for the production cross-sections are assumed. See their Fig. 2b.

$\Gamma(au^+ au^-)/\Gamma_{ m total}$					Γ ₇ /Γ
VALUE	DOCUMENT ID		TECN	COMMENT	
$0.060^{+0.008}_{-0.007}$	¹ ATLAS	22	ATLS	<i>рр</i> , 13 ТеV	

 $^1\mathrm{ATLAS}$ 22 report combined results (see their Extended Data Table 1) using up to 139 fb $^{-1}$ of data at $E_{\rm cm}$ = 13 TeV, assuming m_{H} = 125.09 GeV. SM values for the production cross-sections are assumed. See their Fig. 2b.

$\Gamma(Z\gamma)/\Gamma_{total}$				Г ₈ /Г
VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT	
3.4 ± 1.1 OUR AVERAGE	$[(3.2\pm1.5) imes10^{-3}$ OUR	2023 AVE	RAGE]	
3.4±1.1	¹ AAD 2	24D LHC	<i>рр</i> , 13 ТеV	
\bullet \bullet We do not use the following data for averages, fits, limits, etc. \bullet \bullet				
$3.2 {\pm} 1.5$	² ATLAS 2	22 ATLS	<i>рр</i> , 13 ТеV	

NODE=S126225

NODE=S126R20 NODE=S126R20

NODE=S126R20;LINKAGE=A

NODE=S126R21 NODE=S126R21

NODE=S126R21;LINKAGE=A

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NODE=S126R03 NODE=S126R03

NODE=S126R03:LINKAGE=C NODE=S126R03;LINKAGE=B

NODE=S126R03;LINKAGE=A

NODE=S126R24 NODE=S126R24

NODE=S126R24;LINKAGE=A

NODE=S126R25 NODE=S126R25

NODE=S126R25;LINKAGE=A

NODE=S126R26 NODE=S126R26

NFW

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¹AAD 24D report combined results of ATLAS (AAD 20AG) and CMS (TUMASYAN 23F). SM values for the production cross-sections are assumed.

 $^2\,{\rm ATLAS}$ 22 report combined results (see their Extended Data Table 1) using up to 139 fb⁻¹ of data at $E_{\rm cm}=$ 13 TeV, assuming $m_{H}=$ 125.09 GeV. SM values for the production cross-sections are assumed. See their Fig. 2b.

$\Gamma(Z\rho(770))/\Gamma_{total}$					٦/و٦
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<1.21 × 10 ⁻²	95	¹ SIRUNYAN	20вк CMS	<i>pp</i> , 13 TeV	

¹SIRUNYAN 20BK search for $H \rightarrow Z \rho$, $Z \rightarrow e^+ e^-/\mu^+\mu^-$, $\rho \rightarrow \pi^+\pi^-$ with 137 fb⁻¹ of *pp* collision data at $E_{\rm cm} = 13$ TeV. The quoted branching fraction is for the unpolarized decay. See their Table 3 for different polarizations.

$\Gamma(Z\phi(1020))/\Gamma_{total}$					Г ₁₀ /Г
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<3.6 × 10 ⁻³	95	¹ SIRUNYAN	20BK CMS	<i>рр</i> , 13 ТеV	

¹SIRUNYAN 20BK search for $H \rightarrow Z \phi$, $Z \rightarrow e^+ e^- / \mu^+ \mu^-$, $\phi \rightarrow K^+ K^-$ with 137 fb⁻¹ of pp collision data at $E_{\rm cm}$ = 13 TeV. The quoted branching fraction is for the unpolarized decay. See their Table 4 for different polarizations.

$\Gamma(Z\eta_c)/\Gamma_{\text{total}}$ VALUE

$\Gamma(Z\eta_c)/\Gamma_{\text{total}}$			Г ₁₁ /Г
VALUE	DOCUMENT ID	<u>TECN</u> COMMENT	
\bullet \bullet We do not use the following	ng data for averages,	fits, limits, etc. • • •	
	¹ AAD 2	20AE ATLS <i>pp</i> , 13 TeV	/

¹AAD 20AE search for $H \to Z \eta_c$ with two-leptons $(e^+ e^-/\mu^+\mu^-)$ plus jet events using 139 fb⁻¹ of pp collision data at $E_{\rm cm}$ = 13 TeV. The upper limit of $\sigma(pp \rightarrow H) \cdot B(H \rightarrow H)$ $Z\eta_c$) is 110 pb at 95% CL.

$\Gamma(ZJ/\psi)/\Gamma_{total}$						Γ ₁₂ /Γ	
VALUE	<u>CL%</u>	DOCUMENT ID		TECN	COMMENT		
$<1.9 \times 10^{-3}$	95	¹ TUMASYAN	23C	CMS	<i>рр</i> , 13 ТеV		
$\bullet \bullet \bullet$ We do not use the	e following	g data for averages	s, fits,	limits,	etc. • • •		
		² AAD	20AE	ATLS	<i>рр</i> , 13 ТеV		

¹TUMASYAN 23C search for $H \rightarrow Z J/\psi$, $Z \rightarrow e^+e^-$ or $\mu^+\mu^-$, $J/\psi \rightarrow \mu^+\mu^$ with 138 fb⁻¹ of pp collision data at $E_{\rm cm} = 13$ TeV. The quoted value is for the Higgs decays for longitudinally polarized mesons. See their Table 1 for other cases.

 2 AAD 20AE search for $H o ~Z J/\psi$ with two-leptons $(e^+e^-/\mu^+\mu^-)$ plus jet events using 139 fb⁻¹ of *pp* collision data at $E_{\rm cm} = 13$ TeV. The upper limit of $\sigma(pp \rightarrow H) \cdot B(H \rightarrow ZJ/\psi)$ is 100 pb at 95% CL.

$\Gamma(Z\psi(2S))/\Gamma_{total}$						Г <u>13</u> /Г
VALUE	CL%	DOCUMENT ID		TECN	COMMENT	
$< 6.6 \times 10^{-3}$	95	¹ TUMASYAN	23C	CMS	<i>рр</i> , 13 ТеV	
1			1	_	+ - (

¹TUMASYAN 23C search for $H \to Z\psi(2S), Z \to e^+e^-$ or $\mu^+\mu^-, \psi(2S) \to \mu^+\mu^$ with 138 fb⁻¹ of pp collision data at $E_{\rm cm} = 13$ TeV. The quoted value is for the Higgs decays for longitudinally polarized mesons. See their Table 1 for other cases.

$\Gamma(J/\psi\gamma)/\Gamma_{\rm total}$

 Γ_{14}/Γ

				- 14/ -	
VALUE	<u>CL%</u>	DOCUMENT ID	TECN	COMMENT	
$<2.0 \times 10^{-4}$ (CL = 95%	6) [<3.5	$5 imes 10^{-4}$ (CL = 9	95%) OUR 20	23 BEST LIMIT]	
<2.0 × 10 ⁻⁴	95	¹ AAD	23CD ATLS	13 TeV, 138 fb $^{-1}$	
\bullet \bullet \bullet We do not use the	following	data for averages	s, fits, limits, o	etc. • • •	
$< 7.6 \times 10^{-4}$	95	² SIRUNYAN	19AJ CMS	13 TeV, 35.9 fb $^{-1}$	
$< 3.5 imes 10^{-4}$	95			13 TeV, 36.1 fb $^{-1}$	
	95		16B CMS	8 TeV	
$< 1.5 \times 10^{-3}$	95	⁵ AAD	15I ATLS	8 TeV	
1 AAD 23CD search for at $E_{cm} = 13$ TeV. SI				${\rm fb}^{-1}$ of pp collision datans are assumed.	

²SIRUNYAN 19AJ search for $H \rightarrow J/\psi \gamma$, $J/\psi \rightarrow \mu^+ \mu^-$ with 35.9 fb⁻¹ of pp collision data at $E_{\rm cm} = 13$ TeV. The upper limit corresponds to 260 times the SM prediction and by combining the KHACHATRYAN 16B, it is 220 times the SM prediction.

³AABOUD 18BL search for $H \rightarrow J/\psi \gamma$, $J/\psi \rightarrow \mu^+ \mu^-$ with 36.1 fb⁻¹ of *pp* collision data at $E_{\rm cm}=$ 13 TeV.

⁴KHACHATRYAN 16B use 19.7 fb⁻¹ of pp collision data at 8 TeV.

⁵AAD 15I use 19.7 fb⁻¹ of *pp* collision data at 8 TeV.

NODE=S126R26;LINKAGE=B

NODE=S126R26;LINKAGE=A

NODE=S126R16:LINKAGE=A

NODE=S126R17 NODE=S126R17

NODE=S126R17:LINKAGE=A

NODE=S126R18 NODE=S126R18

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NODE=S126R19 NODE=S126R19

NODE=S126R19:LINKAGE=B

NODE=S126R19;LINKAGE=A

NODE=S126R27 NODE=S126R27

NODE=S126R27;LINKAGE=A

NODE=S126R04 NODE=S126R04

NODE=S126R04;LINKAGE=E

NODE=S126R04;LINKAGE=D

NODE=S126R04;LINKAGE=C

NODE=S126R04;LINKAGE=B NODE=S126R04:LINKAGE=A

$\Gamma(J/\psi J/\psi)/\Gamma_{\text{total}}$	<u>CL%_</u>	DOCUMENT ID	TECN		Г ₁₅ /Г	NODE=S126R13 NODE=S126R13
$<3.8 \times 10^{-4}$ (CL = 9						
<3.8 × 10 ⁻⁴	95		23C CMS	pp, 13 TeV	I	
• • • We do not use th	ne following			etc. • • •	-	
$< 1.8 \times 10^{-3}$	95	² SIRUNYAN	19BR CMS	<i>pp</i> at 13 TeV		
1 TUMASYAN 23C se data at $E_{\rm cm}=13$ polarized mesons. S	3 TeV. The	e quoted value is	for the Higgs	th 138 fb $^{-1}$ of pp c decays for longitude	ollision Idinally	NODE=S126R13;LINKAGE=F
2 SIRUNYAN 19BR se sion data at $E_{cm} =$ For fully longitudina	earch for <i>H</i> = 13 TeV. J	$J ightarrow J/\psi J/\psi$, J/ψ , J/ψ s from the Hig	$\psi ightarrow \ \mu^+ \ \mu^-$ v;gs decay are a	ssumed to be unpo	arized.	NODE=S126R13;LINKAGE=/
$\Gamma(\psi(2S)\gamma)/\Gamma_{total}$					Г ₁₆ /Г	NODE=S126R12
$\frac{VALUE}{<1.05 \times 10^{-3}}$ (CL = 9	<u>CL%_</u> 0 F9/) [$\frac{DOCUMENT ID}{200 \times 10^{-3} (C)}$				NODE=S126R12
$<1.05 \times 10^{-3}$ (CL =)	95%) [<∡ 95	1 AAD	,	13 TeV, 138 fb ⁻²	· •	
• • • We do not use th						
$<2.0 \times 10^{-3}$		² AABOUD		13 TeV, 36.1 fb ⁻	1	
¹ AAD 23CD search f	95 for $H \rightarrow \psi$	$\psi(2S)\gamma, \ \psi(2S) \rightarrow$	$\cdot \ \mu^+ \mu^-$ with	138 fb $^{-1}$ of pp c	ollision	NODE=S126R12;LINKAGE=F
data at $E_{\rm cm} = 13$						
² AABOUD 18BL sea collision data at E _C			$2S) \rightarrow \mu^+ \mu$	2 [—] with 36.1 fb ⁻¹	of pp	NODE=S126R12;LINKAGE=/
$\Gamma(\psi(2S)J/\psi)/\Gamma_{\text{tota}}$	1				Г ₁₇ /Г	NODE=S126R28
VALUE	<u>CL%</u>	DOCUMENT ID	TECN	COMMENT		NODE=S126R28
$<2.1 \times 10^{-3}$	95	¹ TUMASYAN	23C CMS	<i>рр</i> , 13 ТеV		
¹ TUMASYAN 23C se	earch for <i>H</i>	$J ightarrow \psi(2S) J/\psi$, i	$\psi(2S) \rightarrow \mu^+$	$\mu^-, J/\psi \rightarrow \mu^+ \mu^-$	with	NODE=S126R28;LINKAGE=
138 fb ^{—1} of <i>pp</i> co decays for longitudi	ollision data nally polari	a at ${\it E}_{ m cm}=13$ T ized mesons. See	FeV. The quo their Table 1	ted value is for the for other cases.	Higgs	
$\Gamma(\psi(2S)\psi(2S))/\Gamma_{tc}$					Г ₁₈ /Г	NODE=S126R29
<3.0 × 10 ⁻³	<u>CL%</u> 95	<u>DOCUMENT ID</u> ¹ TUMASYAN	<u>TECN</u> 23C CMS	<i><u>COMMENT</u></i> <i>pp</i> , 13 TeV	I	NODE=S126R29
					∎ .a1 ∎	
¹ TUMASYAN 23C s of <i>pp</i> collision data longitudinally polari	a at E _{cm} :	= 13 TeV. The q	uoted value is	s for the Higgs dec	ays for	NODE=S126R29;LINKAGE=/
$\Gamma(\Upsilon(1S)\gamma)/\Gamma_{total}$					Г ₁₉ /Г	
VALUE	<u>CL%</u>	DOCUMENT ID	TECN	COMMENT	137	NODE=S126R05 NODE=S126R05
$<2.5 \times 10^{-4} (CL = 9)$						
< 2.5 × 10⁻⁴ • • • We do not use the	95	¹ AAD	23CD ATLS	13 TeV, 138 fb ⁻²		
$<4.9 imes 10^{-4}$ $<1.3 imes 10^{-3}$	95 95	² AABOUD ³ AAD		13 TeV, 36.1 fb	1	
	or $H \rightarrow \gamma$	$\gamma(1S)\gamma, \ \Upsilon(1S) ightarrow$	$\rightarrow \mu^+\mu^-$ with	n 138 fb $^{-1}$ of pp c	ollision	NODE=S126R05;LINKAGE=0
data at $E_{\rm cm} = 13$	iev. SM v		luction cross-s	ections are assumed	ł.	NODE-SIZONOS,EINNAGE-
data at $E_{\rm cm} = 13$ ² AABOUD 18BL sea	arch for H	\rightarrow $\Upsilon(1S)\gamma$, $\Upsilon($			ł.	
data at $E_{\rm cm} = 13$ ² AABOUD 18BL sea collision data at $E_{\rm c}$ ³ AAD 15I use 19.7 fl	arch for $H_{ m mm}=13~{ m Te}$ ${ m b}^{-1}$ of pp	$ ightarrow ~ arphi(1S)\gamma, ~ arphi($ eV.	$(1S) \rightarrow \mu^+ \mu$	ι^- with 36.1 fb $^{-1}$	1. of <i>pp</i>	NODE=S126R05;LINKAGE=I
data at $E_{\rm cm} = 13$ ² AABOUD 18BL sea collision data at $E_{\rm c}$ ³ AAD 15I use 19.7 fl	arch for $H_{ m mm}=13~{ m Te}$ ${ m b}^{-1}$ of pp	$ ightarrow ~ arphi(1S)\gamma, ~ arphi($ eV.	$(1S) \rightarrow \mu^+ \mu$	ι^- with 36.1 fb $^{-1}$	ł.	NODE=S126R05;LINKAGE=I
data at $E_{cm} = 13$ ² AABOUD 18BL sea collision data at E_c ³ AAD 15I use 19.7 fl $\Gamma(\Upsilon(1S)\Upsilon(1S))/\Gamma_0$ VALUE	arch for $H_{\rm m}=13~{ m Te}$ ${ m b}^{-1}$ of pp total	$ ightarrow \Upsilon(1S)\gamma, \ \Upsilon(eV.$ e collision data at $ ightarrow$ <u>DOCUMENT ID</u>	$(1S) ightarrow \mu^+ \mu$ 8 TeV. <u><i>TECN</i></u>	ι with 36.1 fb ⁻¹ 	1. of <i>pp</i>	NODE=S126R05;LINKAGE=F
data at $E_{cm} = 13$ ² AABOUD 18BL sea collision data at E_c ³ AAD 15I use 19.7 ff $\Gamma(\Upsilon(1S)\Upsilon(1S))/\Gamma_{f}$ <u>VALUE</u> <1.7 × 10 ⁻³	arch for $H_{\rm m} = 13$ Te b^{-1} of pp total $-\frac{CL\%}{95}$	$ ightarrow \Upsilon(1S)\gamma, \ \Upsilon(eV.$ e collision data at $ ightarrow$ $rac{DOCUMENT \ ID}{1}$ TUMASYAN	$(1S) \rightarrow \mu^+ \mu$ 8 TeV. $23C \frac{TECN}{CMS}$	ι with 36.1 fb ⁻¹ <u>COMMENT</u> pp, 13 TeV	d. of <i>pp</i> Γ ₂₀ /Γ	NODE=S126R05;LINKAGE=F NODE=S126R05;LINKAGE=# NODE=S126R30
data at $E_{cm} = 13$ ² AABOUD 18BL sea collision data at E_c ³ AAD 15I use 19.7 fl $\Gamma(\Upsilon(1S)\Upsilon(1S))/\Gamma_0$ VALUE	arch for H m = 13 Te b^{-1} of pp total $- \frac{CL\%}{95}$ search for H a at E_{cm}	$ ightarrow \Upsilon(1S)\gamma, \Upsilon(1S)\gamma, \Upsilon(1S)\gamma, \Upsilon(1S)\gamma, \Upsilon(1S))$ ho collision data at $ hoho DOCUMENT IDho TUMASYAN ho \Upsilon(1S)\Upsilon(1S)\Upsilon(1S)ho = 13$ TeV. The q	$(1S) \rightarrow \mu^+ \mu^-$ 8 TeV. 23C CMS $(1S), \Upsilon(1S) \rightarrow$ guoted value is	μ^- with 36.1 fb ⁻¹ $\frac{COMMENT}{pp, 13 \text{ TeV}}$ $p \mu^+ \mu^-$ with 138 s for the Higgs dec	d. of <i>pp</i> Γ 20/Γ β fb ⁻¹	NODE=S126R05;LINKAGE=F NODE=S126R05;LINKAGE=# NODE=S126R30
data at $E_{cm} = 13$ ² AABOUD 18BL sea collision data at E_c ³ AAD 15I use 19.7 ff $\Gamma(\Upsilon(1S)\Upsilon(1S))/\Gamma_{f}$ <u>VALUE</u> <1.7 × 10 ⁻³ ¹ TUMASYAN 23C s of <i>pp</i> collision data longitudinally polari $\Gamma(\Upsilon(2S)\gamma)/\Gamma_{total}$	arch for H m = 13 Te b^{-1} of pp total $m = \frac{CL\%}{95}$ means for H a at $E_{CM} =$ ized meson	$ ightarrow \Upsilon(1S)\gamma, \Upsilon(eV.$ e collision data at r ightarrow COMMENT ID ightarrow TUMASYAN $ m H ightarrow \Upsilon(1S)\Upsilon(1)$ = 13 TeV. The q is. See their Table	$(15) \rightarrow \mu^+ \mu$ 8 TeV. <u>750</u> <u>7600</u> 23c CMS 23c CMS 23c, $\Upsilon(15) \rightarrow \Pi$ puoted value is 2 1 for other ca	μ^- with 36.1 fb ⁻¹ <u>COMMENT</u> pp, 13 TeV $\mu^+\mu^-$ with 138 s for the Higgs dec ases.	d. of <i>pp</i> Γ 20/Γ β fb ⁻¹	NODE=S126R05;LINKAGE=H NODE=S126R05;LINKAGE=/ NODE=S126R30 NODE=S126R30 NODE=S126R30;LINKAGE=/
data at $E_{cm} = 13$ ² AABOUD 18BL sea collision data at E_c ³ AAD 15I use 19.7 ff $\Gamma(\Upsilon(1S)\Upsilon(1S))/\Gamma_{f}$ <u>VALUE</u> <1.7 × 10 ⁻³ ¹ TUMASYAN 23C s of <i>pp</i> collision data longitudinally polari $\Gamma(\Upsilon(2S)\gamma)/\Gamma_{total}$ <u>VALUE</u>	arch for H m = 13 Te b^{-1} of pp total $m = \frac{CL\%}{95}$ search for H a at $E_{\rm CM}$ ized meson $m = \frac{CL\%}{100}$	$ \begin{array}{rcl} & & & & & & & & & & & & & & & & & & &$	$(15) \rightarrow \mu^+ \mu$ 8 TeV. 23c CMS $(15) \rightarrow \gamma(15) \rightarrow \gamma(15) \rightarrow \gamma(15) \rightarrow \gamma(15)$ $(15) \gamma(15) \rightarrow \gamma(15) \rightarrow \gamma(15) \rightarrow \gamma(15)$ $(15) \gamma(15) \rightarrow \gamma(15) \rightarrow \gamma(15)$	μ^- with 36.1 fb ⁻¹ $\frac{COMMENT}{pp, 13 \text{ TeV}}$ $\Rightarrow \mu^+\mu^-$ with 138 is for the Higgs dec ases. $\underline{COMMENT}$	f. of pp Γ_{20}/Γ B fb ⁻¹ ays for	NODE=S126R05;LINKAGE=H NODE=S126R05;LINKAGE=/ NODE=S126R30 NODE=S126R30 NODE=S126R30;LINKAGE=/
data at $E_{cm} = 13$ ² AABOUD 18BL sea collision data at E_c ³ AAD 15I use 19.7 ff $\Gamma(\Upsilon(1S)\Upsilon(1S))/\Gamma_{ff}$ <u>VALUE</u> <1.7 × 10 ⁻³ ¹ TUMASYAN 23C s of <i>pp</i> collision data longitudinally polari $\Gamma(\Upsilon(2S)\gamma)/\Gamma_{total}$ <u>VALUE</u> <4.2 × 10 ⁻⁴ (CL = 9	arch for H m = 13 Te b^{-1} of pp total $- \frac{CL\%}{95}$ search for H a at $E_{\rm CM} =$ ized meson $- \frac{CL\%}{5\%}$ [<5.	$ \rightarrow \Upsilon(1S)\gamma, \Upsilon($ eV. e collision data at a $ \frac{DOCUMENT \ ID}{1} TUMASYAN $ $H \rightarrow \Upsilon(1S)\Upsilon(1)$ $= 13 \ TeV. \ The q$ is. See their Table $ \frac{DOCUMENT \ ID}{2} $ $.9 \times 10^{-4} \ (CL = $	$(15) \rightarrow \mu^+ \mu$ 8 TeV. 23C CMS $(15) \rightarrow 0$ $(15) \rightarrow$	μ^- with 36.1 fb ⁻¹ pp, 13 TeV pp, 13 TeV $\mu^+\mu^-$ with 138 s for the Higgs dec ases. COMMENT D23 BEST LIMIT]	f. of pp Γ_{20}/Γ I I I I I I I I I I	NODE=S126R05;LINKAGE=I NODE=S126R05;LINKAGE=/ NODE=S126R30 NODE=S126R30 NODE=S126R30;LINKAGE=/
data at $E_{cm} = 13$ ² AABOUD 18BL sea collision data at E_c ³ AAD 15I use 19.7 ff $\Gamma(\Upsilon(1S)\Upsilon(1S))/\Gamma_{f}$ VALUE <1.7 × 10 ⁻³ ¹ TUMASYAN 23C s of pp collision data longitudinally polari $\Gamma(\Upsilon(2S)\gamma)/\Gamma_{total}$ VALUE <4.2 × 10 ⁻⁴ (CL = 9 <4.2 × 10 ⁻⁴	arch for H m = 13 Te b^{-1} of pp total $- \frac{CL\%}{95}$ search for H a at $E_{\rm CM} =$ ized meson $- \frac{CL\%}{95}$ (<5.	$ \rightarrow \Upsilon(1S)\gamma, \Upsilon($ eV. collision data at a $ \frac{DOCUMENT \ ID}{^{1}} TUMASYAN $ $ H \rightarrow \Upsilon(1S)\Upsilon(1) $ = 13 TeV. The q as. See their Table $ \frac{DOCUMENT \ ID}{^{1}} $.9 × 10 ⁻⁴ (CL = 1 AAD	$(15) \rightarrow \mu^+ \mu$ 8 TeV. 23C CMS $(15) \rightarrow 120$ $(15) \rightarrow 100$ $(15) \rightarrow $	μ^{-} with 36.1 fb ⁻¹ pp, 13 TeV pp, 13 TeV $\mu^{+}\mu^{-}$ with 138 s for the Higgs dec ases. $\underline{COMMENT}$ D23 BEST LIMIT] 13 TeV, 138 fb ⁻¹	f. of pp Γ_{20}/Γ I I I I I I I I I I	NODE=S126R05;LINKAGE=I NODE=S126R05;LINKAGE=/ NODE=S126R30 NODE=S126R30 NODE=S126R30;LINKAGE=/
data at $E_{cm} = 13$ ² AABOUD 18BL sea collision data at E_c ³ AAD 15I use 19.7 fl $\Gamma(\Upsilon(1S)\Upsilon(1S))/\Gamma_{1}$ <u>VALUE</u> <1.7 × 10 ⁻³ ¹ TUMASYAN 23C s of <i>pp</i> collision data longitudinally polari $\Gamma(\Upsilon(2S)\gamma)/\Gamma_{total}$ <u>VALUE</u> <4.2 × 10 ⁻⁴ (CL = 9 <4.2 × 10 ⁻⁴	arch for H m = 13 Te b^{-1} of pp total $- \frac{CL\%}{95}$ search for H a at $E_{\rm CM} =$ ized meson $- \frac{CL\%}{95}$ (<5.	$ \rightarrow \Upsilon(1S)\gamma, \Upsilon($ eV. ecollision data at a $ \frac{DOCUMENT \ ID}{1 \ TUMASYAN} $ $H \rightarrow \Upsilon(1S)\Upsilon(1)$ $= 13 \ TeV. \ The q$ is. See their Table $ \frac{DOCUMENT \ ID}{1 \ See their Table} $ $ \frac{DOCUMENT \ ID}{1 \ See their Table} $ $ \frac{DOCUMENT \ ID}{1 \ AAD} $ g data for average $ \frac{2 \ AABOUD}{2 \ ABOUD} $	$(15) \rightarrow \mu^+ \mu^-$ 8 TeV. $23c \ CMS$ $(15), \gamma(15) \rightarrow -$ $(15), \gamma(15), \gamma(15) \rightarrow -$ $(15), \gamma(15) \rightarrow -$ (15	μ^{-} with 36.1 fb ⁻¹ pp, 13 TeV pp, 13 TeV $\mu^{+}\mu^{-}$ with 138 s for the Higgs dec ases. $\underline{COMMENT}$ D23 BEST LIMIT] 13 TeV, 138 fb ⁻¹	$[f_{20}/\Gamma]$ $[f_{20}/\Gamma]$ $[f_{3} fb^{-1}]$ $[f_{21}/\Gamma]$ $[f_{21}/\Gamma]$	NODE=S126R05;LINKAGE=H NODE=S126R05;LINKAGE=/ NODE=S126R30 NODE=S126R30 NODE=S126R30;LINKAGE=/
data at $E_{cm} = 13$ ² AABOUD 18BL sea collision data at E_c ³ AAD 15I use 19.7 fl $\Gamma(\Upsilon(1S)\Upsilon(1S))/\Gamma_{1}$ <u>VALUE</u> <1.7 × 10 ⁻³ ¹ TUMASYAN 23C s of <i>pp</i> collision data longitudinally polari $\Gamma(\Upsilon(2S)\gamma)/\Gamma_{total}$ <u>VALUE</u> <4.2 × 10 ⁻⁴ (CL = 9 <4.2 × 10 ⁻⁴ • • We do not use th	arch for H m = 13 Te b^{-1} of pp total $- \frac{CL\%}{95}$ search for H a at E_{CM} ized meson $- \frac{CL\%}{95}$ 5%) [<5. 95 ne following	$ \rightarrow \Upsilon(1S)\gamma, \Upsilon($ eV. ecollision data at a $ \frac{DOCUMENT \ ID}{1 \ TUMASYAN} $ $H \rightarrow \Upsilon(1S)\Upsilon(1)$ $= 13 \ TeV. \ The q$ is. See their Table $ \frac{DOCUMENT \ ID}{1 \ S} $ $ 9 \times 10^{-4} \ (CL = 1 \ AAD \ g \ data \ for \ average$	$(15) \rightarrow \mu^+ \mu^-$ 8 TeV. $23c \ CMS$ $(15), \gamma(15) \rightarrow -$ $(15), \gamma(15), \gamma(15) \rightarrow -$ $(15), \gamma(15) \rightarrow -$ (15	$\mu^{-} \text{ with } 36.1 \text{ fb}^{-1}$ $\frac{COMMENT}{pp, 13 \text{ TeV}}$ $\Rightarrow \mu^{+}\mu^{-} \text{ with } 138$ s for the Higgs dec ases. $\frac{COMMENT}{223 \text{ BEST LIMIT]}}$ 13 TeV, 138 fb^{-1} etc. • • • 13 TeV, 36.1 fb^{-1}	$[f_{20}/\Gamma]$ $[f_{20}/\Gamma]$ $[f_{3} fb^{-1}]$ $[f_{21}/\Gamma]$ $[f_{21}/\Gamma]$	NODE=S126R05;LINKAGE= NODE=S126R05;LINKAGE= NODE=S126R30 NODE=S126R30 NODE=S126R30;LINKAGE= NODE=S126R06

NODE=S126R00;LINKAGE=A

¹AAD 23CD search for $H \rightarrow \Upsilon(2S)\gamma$, $\Upsilon(2S) \rightarrow \mu^+\mu^-$ with 138 fb⁻¹ of pp collision NODE=S126R06;LINKAGE=C data at $E_{\rm cm} = 13$ TeV. SM values for the production cross-sections are assumed. ²AABOUD 18BL search for $H \rightarrow \Upsilon(2S)\gamma$, $\Upsilon(2S) \rightarrow \mu^+\mu^-$ with 36.1 fb⁻¹ of ppNODE=S126R06;LINKAGE=B collision data at $E_{\rm cm} = 13$ TeV. ³AAD 15I use 19.7 fb⁻¹ of pp collision data at 8 TeV. NODE=S126R06;LINKAGE=A $\Gamma(\Upsilon(3S)\gamma)/\Gamma_{\text{total}}$ Γ_{22}/Γ NODE=S126R07 NODE=S126R07 VALUE DOCUMENT ID TECN COMMENT CL% $<3.4 \times 10^{-4}$ (CL = 95%) [<5.7 × 10⁻⁴ (CL = 95%) OUR 2023 BEST LIMIT] $<3.4 \times 10^{-4}$ 95 1 AAD 23CD ATLS 13 TeV, 138 fb⁻¹ • • • We do not use the following data for averages, fits, limits, etc. • • • ² AABOUD $< 5.7 imes 10^{-4}$ 18BL ATLS 13 TeV, 36.1 fb⁻¹ 95 ${<}1.3\times10^{-3}$ ³ AAD 95 151 ATLS 8 TeV ¹AAD 23CD search for $H \rightarrow \Upsilon(3S)\gamma$, $\Upsilon(3S) \rightarrow \mu^+\mu^-$ with 138 fb⁻¹ of pp collision NODE=S126R07;LINKAGE=C data at $E_{\rm cm} = 13$ TeV. SM values for the production cross-sections are assumed. ²AABOUD 18BL search for $H \rightarrow \Upsilon(3S)\gamma$, $\Upsilon(3S) \rightarrow \mu^+\mu^-$ with 36.1 fb⁻¹ of ppNODE=S126R07;LINKAGE=B collision data at $E_{\rm cm} = 13$ TeV. ³AAD 15I use 19.7 fb⁻¹ of *pp* collision data at 8 TeV. NODE=S126R07;LINKAGE=A $\Gamma(\Upsilon(nS)\Upsilon(mS))/\Gamma_{total}$ Γ_{23}/Γ NODE=S126R14 NODE=S126R14 VALUE CL% DOCUMENT ID ____<u>TECN</u>___COMMENT **<3.5 × 10⁻⁴ (CL = 95%)** [<1.4 × 10⁻³ (CL = 95%) OUR 2023 BEST LIMIT] <3.5 × 10⁻⁴ ¹ TUMASYAN 23C CMS *pp*, 13 TeV 95 I • • • We do not use the following data for averages, fits, limits, etc. • • • $< 1.4 \times 10^{-3}$ ² SIRUNYAN 95 19BR CMS pp, 13 TeV ¹TUMASYAN 23C search for $H \rightarrow \Upsilon(nS) \Upsilon(mS)$ with $\Upsilon(nS)$, $\Upsilon(mS) \rightarrow \mu^+ \mu^-$ (n, NODE=S126R14;LINKAGE=B m = 1, 2, 3) with 138 fb⁻¹ of pp collision data at $E_{\rm cm}$ = 13 TeV. The quoted value is for the Higgs decays for longitudinally polarized mesons. See their Table 1 for other cases. 2 SIRUNYAN 19BR search for $H \rightarrow ~\Upsilon$ (nS) Υ (mS) with Υ (nS), Υ (mS) $\rightarrow ~\mu^+\mu^-$ (n, m NODE=S126R14;LINKAGE=A = 1, 2, 3) for 37.5 fb⁻¹ of pp collision data at $E_{\rm cm}$ = 13 TeV. Υ s from the Higgs decay are assumed to be unpolarized. For fully longitudinal (transverse) polarized $\tilde{\gamma}$ s, limits change by -22% (+10%). The three Υ states selected in a mass range of 8.5–11 GeV are not distinguished. $\Gamma(\rho(770)\gamma)/\Gamma_{\text{total}}$ Γ_{24}/Γ NODE=S126R11 VALUE DOCUMENT ID _____COMMENT NODE=S126R11 CL% <10.4 × 10⁻⁴ (CL = 95%) [$< 8.8 \times 10^{-4}$ (CL = 95%) OUR 2023 BEST LIMIT] $<10.4 \times 10^{-4}$ ¹ AABOUD 95 18AU ATLS pp, 13 TeV ¹AABOUD 18AU use 35.6 fb⁻¹ of pp collision data at 13 TeV. See their erratum NODE=S126R11:LINKAGE=A AABOUD 23A. $\Gamma(\omega(782)\gamma)/\Gamma_{\text{total}}$ Γ_{25}/Γ NODE=S126R31 NODE=S126R31 DOCUMENT ID TECN COMMENT VALUE CL% ¹ AAD $<5.5 \times 10^{-4}$ 95 23BS ATLS pp. 13 TeV ¹AAD 23BS use 89.5 fb⁻¹ of *pp* collision data at 13 TeV. NODE=S126R31;LINKAGE=A $\Gamma(K^*(892)\gamma)/\Gamma_{total}$ Γ_{26}/Γ NODE=S126R32 NODE=S126R32 VALUE <u>CL%</u> DOCUMENT ID TECN COMMENT <2.2 × 10⁻⁴ 95 ¹ AAD 23BS ATLS pp, 13 TeV ¹AAD 23BS use 134 fb⁻¹ of *pp* collision data at 13 TeV. NODE=S126R32:LINKAGE=A $\Gamma(\phi(1020)\gamma)/\Gamma_{\text{total}}$ Γ_{27}/Γ NODE=S126R00 NODE=S126R00 VALUE DOCUMENT ID ____<u>TECN</u>___COMMENT CL% $<5 \times 10^{-4}$ (CL = 95%) [$<4.8 \times 10^{-4}$ (CL = 95%) OUR 2023 BEST LIMIT] $<5 \times 10^{-4}$ ¹ AABOUD 18AU ATLS pp, 13 TeV 95 • • • We do not use the following data for averages, fits, limits, etc. • • • ² AABOUD $< 1.4 \times 10^{-3}$ 95 16K ATLS pp, 13 TeV ¹AABOUD 18AU use 35.6 fb⁻¹ of pp collision data at 13 TeV. See their erratum NODE=S126R00;LINKAGE=B AABOUD 23A. ²AABOUD 16K use 2.7 fb⁻¹ of pp collision data at 13 TeV.

					F /F		
Γ(eμ)/Γ _{total} _{VALUE}	CL%	DOCUMENT ID	TECN	COMMENT	Г ₂₈ /Г		NODE=S126R09 NODE=S126R09
$<4.4 \times 10^{-5}$ (CL = 95)		1×10^{-5} (CL = 9	5%) OUR 20]	_	
$<4.4\times10^{-5}$	95 fallouing	¹ HAYRAPETY		<i>pp</i> , 13 TeV			
• • • We do not use the $<\!\!6.1 imes10^{-5}$	95	-		etc. ● ● ● <i>pp</i> , 13 TeV			
$<3.5 \times 10^{-4}$	95 95	³ KHACHATRY		<i>pp</i> , 13 TeV <i>pp</i> , 8 TeV			
¹ HAYRAPETYAN 230	C use 138	fb^{-1} of pp collision	ons at <i>E_cm</i>	= 13 TeV. The I	imit con-		NODE=S126R09;LINKAGE=C
strains the $Y_{e\mu}$ Yuk	awa coup	ling to $\sqrt{ Y_{e\mu} ^2}$ -	$+ Y_{\mu e} ^{2} <$	$1.9 imes10^{-4}$ at	95% CL		
(see their Fig. 6). ² AAD 20F use 139 fb	p^{-1} of p_{I}	p collisions at E_{cm}	= 13 TeV.	The best-fit value	ue of the	I	NODE=S126R09;LINKAGE=B
$H ightarrow e \mu$ branching	fraction is	$s~(0.4\pm2.9\pm0.3)$	$ imes 10^{-5}$ for	$m_H = 125$ GeV.			NODE-SIZONOS,ENNAGE-D
³ KHACHATRYAN 160							NODE=S126R09;LINKAGE=A
The limit constrains at 95% CL (see their		Yukawa coupling to	$\sqrt{ \gamma_{e\mu} ^2}$	$ Y_{\mu e} ^2 < 5.4$	+×10 +		
					F / F		
Γ(eτ)/Γ _{total} _{VALUE}	CL%	DOCUMENT ID	TECN	COMMENT	Г ₂₉ /Г		NODE=S126R10 NODE=S126R10
$< 2.0 \times 10^{-3} (CL = 9)$					Т]	_	
$< 2.0 \times 10^{-3}$	95 C III			<i>pp</i> , 13 TeV			
• • • We do not use the $< 2.3 \times 10^{-3}$	95			etc. ● ● ● <i>pp</i> , 13 TeV		I	OCCUR=2
$< 2.2 \times 10^{-3}$	95 95	³ SIRUNYAN	21z CMS			8	
$< 4.7 imes 10^{-3} \ < 6.1 imes 10^{-3}$	95 95	-	20A ATLS 18BH CMS	<i>рр</i> , 13 TeV <i>рр</i> , 13 TeV			
$< 10.4 \times 10^{-3}$	95 95	⁶ AAD	17 ATLS				
$< 6.9 \times 10^{-3}$	95	⁷ KHACHATRY		<i>рр</i> , 8 ТеV			
¹ AAD 23Q search for <i>H</i> obtained from a simu	H ightarrow e au in ltaneous f	n 138 fb $^{-1}$ of pp co it of possible $H o r$	ollisions at E_{c} e $ au$ and $H \rightarrow$	$c_{ m m}=$ 13 TeV. The μau signals (see t	e result is heir Figs.		NODE=S126R10;LINKAGE=F
13 and 14). The lim			a coupling t	o $\sqrt{ \mathbf{Y}_{e\tau} ^2 + \mathbf{Y}_{e\tau} ^2}$	$(\tau_{\tau e} ^2 < $		
$1.3 imes10^{-3}$ at 95% 2 AAD 23Q search for .			collicione et	F = 12 TeV/2	The lineit		
constrains the $Y_{e\tau}$							NODE=S126R10;LINKAGE=G
(see their Fig. 12).		•					
³ SIRUNYAN 21Z sear							NODE=S126R10;LINKAGE=E
The limit constrains - at 95% CL (see their	the $Y_{e\tau}$ Nr Fig. 8)	Yukawa coupling to	$\sqrt{ Y_{e\tau} ^2}$ +	$ Y_{\tau e} ^2 < 1.35$	5×10^{-3}		
⁴ AAD 20A search for <i>I</i>		in 36.1 fb $^{-1}$ of pp	collisions at	$E_{\rm cm} = 13$ TeV.	The limit		NODE=S126R10;LINKAGE=D
constrains the $Y_{e\tau}$ Y	Yukawa co	upling to $\sqrt{ Y_{e\tau} ^2}$	$(2 + Y_{\tau e} ^2)$	$<~2.0 imes10^{-3}$ at	95% CL		
(see their Fig. 5). ⁵ SIRUNYAN 18BH sea	arch for <i>H</i>	$\rightarrow e\tau$ in 35.9 fb ⁻	$^{-1}$ of pp col	lisions at $F =$	13 TeV		
The limit constrains							NODE=S126R10;LINKAGE=C
at 95% CL (see their	r Fig. 10).						
⁶ AAD 17 search for <i>H</i> ⁷ KHACHATRYAN 160					= 8 TeV.		NODE=S126R10;LINKAGE=B
The limit constrains							NODE=S126R10;LINKAGE=A
at 95% CL (see their			γ · · C / ·	1 7 61			
$\Gamma(\mu au)/\Gamma_{ ext{total}}$					Г ₃₀ /Г		NODE=S126R02
<u>VALUE</u> < 1.5 × 10 ⁻³	_ <u>CL%</u> 95	DOCUMENT ID	<u>TECN</u>	COMMENT			NODE=S126R02
 • • • We do not use the 		¹ SIRUNYAN g data for averages,	21z CMS fits, limits,	<i>pp</i> , 13 TeV etc. ● ● ●			
$< 1.8 \times 10^{-3}$	95	2	23Q ATLS	<i>рр</i> , 13 ТеV			
$< 1.7 \times 10^{-3} \ < 2.8 \times 10^{-3}$	95 95	4	23Q ATLS 20A ATLS	<i>рр</i> , 13 TeV <i>рр</i> , 13 TeV		I	OCCUR=2
$< 26 \times 10^{-2}$	95 95	⁵ AAIJ	18AMLHCB	<i>pp</i> , 8 TeV			
$< 2.5 \times 10^{-3} \ < 1.43 \times 10^{-2}$	95 95	⁶ SIRUNYAN ⁷ AAD	18BH CMS 17 ATLS	<i>рр</i> , 13 TeV <i>рр</i> , 8 TeV			
< 1.43×10^{-2} < 1.51×10^{-2}	95 95	⁸ KHACHATRY		<i>рр</i> , 8 теv <i>рр</i> , 8 ТеV			

NODE=S126R02;LINKAGE=F

NODE=S126R02;LINKAGE=G

NODE=S126R02;LINKAGE=H

NODE=S126R02;LINKAGE=E

NODE=S126R02;LINKAGE=D

NODE=S126R02;LINKAGE=C

NODE=S126R02;LINKAGE=B

NODE=S126R02;LINKAGE=A

¹SIRUNYAN 21Z search for $H \rightarrow \mu \tau$ in 137 fb⁻¹ of *pp* collisions at $E_{\sf cm} =$ 13 TeV. The limit constrains the $Y_{\mu\tau}$ Yukawa coupling to $\sqrt{|Y_{\mu\tau}|^2 + |Y_{\tau\mu}|^2} < 1.11 \times 10^{-3}$ at 95% CL (see their Fig. 8).

²AAD 23Q search for $H \rightarrow \mu \tau$ in 138 fb⁻¹ of *pp* collisions at $E_{cm} = 13$ TeV. The result is obtained from a simultaneous fit of possible $H \rightarrow e\tau$ and $H \rightarrow \mu \tau$ signals (see their Figs. 13 and 14). The limit constrains the $Y_{\mu\tau}$ Yukawa coupling to $\sqrt{|Y_{\mu\tau}|^2 + |Y_{\tau\mu}|^2} <$ 1.2×10^{-3} at 95% CL (see their Fig. 15)

³AAD 23Q search for $H \rightarrow \mu \tau$ in 138 fb⁻¹ of *pp* collisions at $E_{\rm cm} = 13$ TeV. The limit constrains the $Y_{\mu\,\tau}$ Yukawa coupling to $\sqrt{|Y_{\mu\,\tau}|^2+|Y_{\tau\,\mu}|^2}~<~1.2\times10^{-3}$ at 95% CL (see their Fig. 12).

⁴AAD 20A search for $H \rightarrow \mu \tau$ in 36.1 fb⁻¹ of pp collisions at $E_{\rm cm} = 13$ TeV. The limit constrains the $Y_{\mu\tau}$ Yukawa coupling to $\sqrt{|Y_{\mu\tau}|^2 + |Y_{\tau\mu}|^2} < 1.5 \times 10^{-3}$ at 95% CL (see their Fig. 5).

⁵AAIJ 18AM search for $H
ightarrow \mu au$ in 2.0 fb $^{-1}$ of pp collisions at $E_{
m cm}=$ 8 TeV. The limit constrains the Y_{\mu\tau} Yukawa coupling to $\sqrt{|Y_{\mu\tau}|^2 + |Y_{\tau\mu}|^2}$ < 1.7 × 10⁻² at 95% CL assuming SM production cross sections.

⁶SIRUNYAN 18BH search for $H \rightarrow \mu \tau$ in 35.9 fb⁻¹ of *pp* collisions at $E_{\rm cm} = 13$ TeV. The limit constrains the $Y_{\mu\tau}$ Yukawa coupling to $\sqrt{|Y_{\mu\tau}|^2 + |Y_{\tau\mu}|^2} < 1.43 imes 10^{-3}$ at 95% CL (see their Fig. 10).

⁷ AAD 17 search for $H \rightarrow \mu \tau$ in 20.3 fb⁻¹ of *pp* collisions at $E_{\rm cm} = 8$ TeV.

⁸KHACHATRYAN 15Q search for $H \rightarrow \mu \tau$ with τ decaying electronically or hadronically in 19.7 fb⁻¹ of pp collisions at $E_{cm} = 8$ TeV. The fit gives B($H \rightarrow \mu \tau$) = (0.84 $\substack{+0.39\\-0.37}$)% with a significance of 2.4 σ .

$\Gamma(\text{invisible})/\Gamma_{\text{total}}$

$\Gamma(invisible)/\Gamma_{total}$				Г ₃₁ /Г	-	NODE=S126R01
Invisible final st	ates.					NODE=S126R01
VALUE	CL%	DOCUMENT ID	TECN		_	NODE=S126R01
<0.107 (CL = 95%)	-	CL = 95%) OUR		•	_	
<0.107	95	¹ AAD		<i>рр</i> , 7, 8, 13 ТеV		OCCUR=2
• • • We do not use	the follo		iges, fits, limi	ts, etc. ● ● ●	_	
<0.113	95	² AAD	23A ATLS	<i>рр</i> , 13 ТеV		
<0.38	95	³ AAD	23AF ATLS	$pp ightarrow t \overline{t} H$, 13 TeV		
<0.54	95	⁴ TUMASYAN	23ba CMS	$pp \rightarrow t\overline{t}H, V(\rightarrow q\overline{q})$		
<0.15	95	⁵ TUMASYAN	23BA CMS	<i>H</i> , 13 TeV рр, 7, 8, 13 TeV		OCCUR=2
<0.19	95	⁶ AAD	22D ATLS	$pp \rightarrow ZH$, 13 TeV		000011 2
<0.145	95	⁷ AAD	22P ATLS	$pp \rightarrow qqH$, 13 TeV		
<0.37	95	⁸ AAD	22s ATLS	$pp \rightarrow qqH\gamma$, 13 TeV		
<0.13	95	⁹ ATLAS	22 ATLS	<i>pp</i> , 13 TeV		
<0.16	95	¹⁰ CMS	22 CMS	<i>pp</i> , 13 TeV		
<0.18	95	¹¹ TUMASYAN	22G CMS	$pp \rightarrow qqH$, 8, 13 TeV		
<0.18	95	¹² TUMASYAN	22G CMS	$pp \rightarrow qqH$, 13 TeV		OCCUR=2
<0.34	95	¹³ AAD	21F ATLS	pp, 13 TeV		
<0.29	95	¹⁴ SIRUNYAN	21A CMS	$pp \rightarrow ZH$, 13 TeV		
<0.278	95	¹⁵ TUMASYAN	21D CMS	pp, 13 TeV, jet or $V(\rightarrow$		
		16		$q\overline{q}$		
<0.37	95	¹⁶ AABOUD	19AI ATLS	pp ightarrow q q H, 13 TeV		
<0.38	95	¹⁷ AABOUD	19al ATLS	<i>рр</i> , 13 ТеV		
<0.26	95	¹⁸ AABOUD	19AL ATLS	<i>pp</i> , 7, 8, 13 TeV		OCCUR=2
<0.22	95	¹⁹ SIRUNYAN	19AT CMS	<i>рр</i> , 13 ТеV		
< 0.33	95	²⁰ SIRUNYAN	19B0 CMS	$pp \rightarrow qqH$, 13 TeV		
< 0.26	95	²¹ SIRUNYAN	19B0 CMS	pp, 13 TeV		OCCUR=2
<0.19	95	²² SIRUNYAN ²³ AABOUD	19BO CMS	pp, 7, 8, 13 TeV		OCCUR=3
< 0.67	95 05	²⁴ AABOUD	18 ATLS	$pp \rightarrow ZH$, 13 TeV		
<0.83	95	- AABOOD	18ca ATLS	$pp ightarrow WH/ZH, \ W/Z ightarrow jj, 13 \ { m TeV}$		
<0.40	95	²⁵ SIRUNYAN	18BV CMS	$pp \rightarrow ZH$, 13 TeV		
<0.53	95	²⁶ SIRUNYAN	185 CMS	pp, 13 TeV, jet or $V(\rightarrow$		
0.00	55	Sinternation	105 61115	$q\overline{q}$		
<0.46	95	²⁷ AABOUD	17BD ATLS	$pp \rightarrow Hj, qqH, 13 \text{ TeV}$		
<0.24	95	²⁸ KHACHATRY.	17F CMS	<i>pp</i> , 7, 8, 13 TeV		
<0.28	95	²⁹ AAD	16AF ATLS	$pp \rightarrow qqH$, 8 TeV		
<0.34	95	³⁰ AAD	16AN LHC	<i>pp</i> , 7, 8 TeV		
<0.78	95	³¹ AAD	15BD ATLS	$pp \rightarrow WH/ZH$, 8 TeV		
<0.25	95	³² AAD	15cx ATLS	<i>pp</i> , 7, 8 TeV		
<0.75	95	³³ AAD	140 ATLS	$pp \rightarrow ZH$, 7, 8 TeV		
<0.58	95	³⁴ CHATRCHYAN		$pp \rightarrow ZH, qqH$		
<0.81	95	³⁵ CHATRCHYAN	14B CMS	$pp \rightarrow ZH$, 7, 8 TeV		OCCUR=2
<0.65	95	³⁶ CHATRCHYAN	14B CMS	$pp \rightarrow qqH$, 8 TeV		OCCUR=3

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¹ AAD 23A report the combined results of 7, 8 (AAD 15CX) and 13 TeV assuming the Standard Model cross section ($m_H = 125$ GeV). See their Table 1 and Fig. 3.	NODE=S126R01;LINKAGE=GA
² AAD 23A report the combined results using 139 fb ⁻¹ of data at $E_{\rm cm} = 13$ TeV, where H decaying to invisible final states in VBF (AAD 22P), ZH , $Z \rightarrow ee$, $\mu\mu$ (AAD 22D), $pp \rightarrow t\bar{t}H$ (AAD 23AF), VBF+ γ (AAD 22S) and gluon-fusion production with an energetic jet (AAD 21F) assuming the Standard Model cross section ($m_{H} = 125$ GeV). See their Table 1 and Fig. 3.	NODE=S126R01;LINKAGE=FA
³ AAD 23AF search for $pp \rightarrow t\bar{t}H$ with H decaying to invisible final states using 139 fb ⁻¹ of data. The quoted limit on the branching ratio is given for $m_{H} = 125$ GeV and assumes the Standard Model cross section. See their Table 3 for different decay topologies.	NODE=S126R01;LINKAGE=EA
⁴ TUMASYAN 23BA search for <i>H</i> decaying to invisible final states produced in association with a $t\bar{t}$ or a <i>V</i> , which decay to a fully hadronic final state. 138 fb ⁻¹ of data is used. The quoted limit on the branching ratio is given for $m_H = 125$ GeV and assumes the Standard Model cross section. See their Fig. 6 for the results of individual topologies.	NODE=S126R01;LINKAGE=HA
⁵ TUMASYAN 23BA report the combined results of 7, 8, and 13 TeV assuming the Stan- dard Model cross section ($m_{H} = 125$ GeV). They combine results from TUMASYAN 22G, SIRUNYAN 21A, SIRUNYAN 21B, TUMASYAN 21D, SIRUNYAN 20AH, KHACHA- TRYAN 17F, CHATRCHYAN 14B as shown in their Table 8. See their Fig. 7 and Table 9 for the results of individual topologies.	NODE=S126R01;LINKAGE=IA
⁶ AAD 22D search for <i>H</i> decaying to invisible final states associated with a <i>Z</i> decaying $ee/\mu\mu$ using 139 fb ⁻¹ at 13 TeV. The limit is obtained for $m_{H} = 125$ GeV and assuming the SM <i>ZH</i> production cross section. The branching ratio is obtained to be $(0.3 \pm 9.0)\%$.	NODE=S126R01;LINKAGE=X
⁷ AAD 22P search for $pp \rightarrow qqHX$ (VBF) with H decaying to invisible final states using 139 fb ⁻¹ of data. The quoted limit on the branching ratio is given for $m_H = 125$ GeV and assumes the Standard Model cross section.	NODE=S126R01;LINKAGE=Y
⁸ AAD 22S observe electroweak $Z(\rightarrow \nu\nu)\gamma+2$ jets production process with 139 fb ⁻¹ of data. This result is applicable to search for $pp \rightarrow qqH\gamma X$ (VBF+ γ) with H decaying to invisible final states. The quoted limit on the branching ratio is given for $m_H = 125$	NODE=S126R01;LINKAGE=BA
GeV and assumes the Standard Model cross section. ⁹ ATLAS 22 report the combined results using 139 fb ⁻¹ of data at $E_{\rm cm} = 13$ TeV, where <i>H</i> decaying to invisible final states in VBF (AAD 22P), and <i>ZH</i> , <i>Z</i> $\rightarrow ee$, $\mu\mu$ (AAD 22D), assuming $\kappa_V \leq 1$ and $B_{undetected} \geq 0$.	NODE=S126R01;LINKAGE=DA
¹⁰ CMS 22 report the combined results using (a part of) 138 fb ⁻¹ of data at $E_{\rm cm} = 13$ TeV, where <i>H</i> decaying to invisible final states in VBF (SIRUNYAN 19BO), associated with an energetic jet or a $V(\rightarrow q\bar{q})$ (TUMASYAN 21D), and <i>ZH</i> , $Z \rightarrow ee$, $\mu\mu$ (SIRUNYAN 21A) and assuming $\kappa_V \leq 1$ and $B_{undetected} \geq 0$.	NODE=S126R01;LINKAGE=CA
¹¹ TUMASYAN 22G combine 13 TeV 101 fb ⁻¹ results with 8 TeV (KHACHATRYAN 17F) and other 13 TeV (KHACHATRYAN 17F for 2015 and SIRUNYAN 19B0 for 2016) for <i>H</i> decaying to invisible final states with VBF topology. The quoted limit on the branching ratio is given for $m_H = 125.38$ GeV and assumes the Standard Model production rates. The branching ratio is obtained to be $0.086^{+}_{-0.052}$. See their Figs. 11 and 12.	NODE=S126R01;LINKAGE=Z
¹² TUMASYAN 22G search for $pp \rightarrow qqHX$ (VBF) with <i>H</i> decaying to invisible final states using 101 fb ⁻¹ of data (2017 and 2018). The quoted limit on the branching ratio is given for $m_H = 125.38$ GeV and assumes the Standard Model cross section. See their Figs. 11 and 12.	NODE=S126R01;LINKAGE=AA
¹³ AAD 21F search for an invisibly decaying Higgs boson with an energetic jet ($p_T > 150$ GeV) and missing transverse momentum (> 200 GeV) in 139 fb ⁻¹ at $E_{cm} = 13$ TeV. The quoted limit on the branching ratio is given for $m_H = 125$ GeV.	NODE=S126R01;LINKAGE=V
¹⁴ SIRUNYAN 21A search for <i>H</i> decaying to invisible final states associated with a <i>Z</i> decaying $ee/\mu\mu$ using 137 fb ⁻¹ at 13 TeV. The limit is obtained for $m_H = 125$ GeV and assuming the SM <i>ZH</i> production cross section.	NODE=\$126R01;LINKAGE=U
¹⁵ TUMASYAN 21D search for <i>H</i> decaying to invisible final states associated with an energetic jet or a $V, V \rightarrow q\bar{q}$ using 101 fb ⁻¹ at 13 TeV and the result is combined with SIRUNYAN 18S.	NODE=S126R01;LINKAGE=W
¹⁶ AABOUD 19AI search for $pp \rightarrow qqHX$ (VBF) with <i>H</i> decaying to invisible final states using 36.1 fb ⁻¹ of data. The quoted limit on the branching ratio is given for $m_H =$ 125 GeV and assumes the Standard Model rates for VBF and gluon-fusion production.	NODE=S126R01;LINKAGE=K
¹⁷ AABOUD 19AL combine results of <i>H</i> decaying to invisible final states with VBF(AABOUD 19AI), <i>Z H</i> , and <i>W H</i> productions (AABOUD 18, AABOUD 18CA), which	NODE=S126R01;LINKAGE=M
use 36.1 fb ⁻¹ of data at 13 TeV. The quoted limit is given for $m_H = 125$ GeV and assumes the Standard Model rates for gluon fusion, VBF, ZH, and WH productions. ¹⁸ AABOUD 19AL combine results of 7, 8 (AAD 15CX), and 13 TeV for H decaying to invisible final states.	NODE=S126R01;LINKAGE=N
¹⁹ SIRUNYAN 19AT perform a combined fit with visible decay using 35.9 fb ^{-1} of data at 13 TeV.	NODE=S126R01;LINKAGE=O
²⁰ SIRUNYAN 19BO search for $pp \rightarrow qqHX$ (VBF) with <i>H</i> decaying to invisible final states using 35.9 fb ⁻¹ of data. The quoted limit on the branching ratio is given for m_H	NODE=S126R01;LINKAGE=P
= 125.09 GeV and assumes the Standard Model production rates. ²¹ SIRUNYAN 19B0 combine the VBF channel with results of other 13 TeV analyses: SIRUNYAN 18BV and SIRUNYAN 18S. The quoted limit on the branching ratio is given for $m_H = 125.09$ GeV and assumes the Standard Model production rates.	NODE=S126R01;LINKAGE=S

TRYAN 17F ratio is give	⁼) for <i>H</i> dee n for <i>m_H =</i>	nbine 13 TeV 35.9 caying to invisible fi = 125.09 GeV and a	nal states. The ssumes the Star	quoted limit on the ndard Model produe	branching	NODE=S126R01;LINKA	GE=T
²³ AABOUD 1	8 search fo	obtained to be 0.05 or $pp \rightarrow HZX, Z$ $E_{\rm cm} = 13$ TeV. The ad assumes the Stan	$ ightarrow$ ee, $\mu\mu$ wit	h H decaying to in	visible final tio is given	NODE=S126R01;LINKA	GE=H
²⁴ AABOUD 1 productions TeV is used	18CA searc <mark>l</mark> , where <i>W</i> 1. The quo	h for <i>H</i> decaying t and <i>Z</i> hadronically oted limit assumes S	o invisible final decay. The dat M production o	states using WH ta of 36.1 fb ⁻¹ at cross sections with	, and ZH	NODE=S126R01;LINKA	.GE=J
²⁵ SIRUNYAN <i>ll</i> using 35.	18BV searc .9 fb $^{-1}$ at	WH, ZH, ggF and th for H decaying to 13 TeV.The limit is n cross section.	invisible final st	ates associated with	h a $Z, Z ightarrow$ d assuming	NODE=S126R01;LINKA	GE=R
²⁶ SIRUNYAN	18S search	for <i>H</i> decaying to in using 35.9 fb ^{-1} at 2	visible final state	es associated with a	n energetic	NODE=S126R01;LINKA	GE=Q
²⁷ AABOUD 1	7BD search	of <i>pp</i> collisions at <i>l</i> ent. The quoted lim	invisible final s	tates with ≥ 1 je A cross-section rat $\mu = 125$ GeV.	t and VBF io <i>R^{miss}</i> is	NODE=S126R01;LINKA	GE=I
²⁸ KHACHATF VBF, <i>Z H</i> , a	RYAN 17F and <i>WH</i> pr	search for <i>H</i> decayi roductions using 2.3	ng to invisible fb ⁻¹ of <i>pp</i> coll	final states with gluin $E_{ m cm}=13$	uon fusion, 8 TeV, 19.7	NODE=S126R01;LINKA	GE=G
assumes the	e Standard	L fb $^{-1}$ at 7 TeV. Th Model rates for glue	on fusion, VBF,	ZH, and WH pro	ductions.		
20.3 fb ^{—1} a 125 GeV an	t E _{cm} = 8 d assumes	pp ightarrow qqHX (VB 3 TeV. The quoted I the Standard Mode	mit on the bran I rates for VBF	ching ratio is given and gluon-fusion p	for $m_H =$ roduction.	NODE=S126R01;LINKA	GE=E
³⁰ AAD 16AN branching fi	perform fit raction of	ts to the ATLAS and decays into BSM pred for $m_0 = 125.09$	nd CMS data a articles that ar	t $E_{\rm cm} = 7$ and 8	TeV. The	NODE=S126R01;LINKA	GE=F
³¹ AAD 15BD s and <i>H</i> decay given for <i>m</i> and is based	earch for <i>p</i> ying to invi H = 125 Ge	$p \rightarrow HWX$ and $p\mu$ sible final states using eV, assumes the Star bination of the contribution of the star	$p ightarrow HZX$ with hg data at $E_{ m cm}$ dard Model rate	= 8 TeV. The quo es for the productio	ted limit is n processes	NODE=S126R01;LINKA	.GE=D
productions for m _H = 1	using 20.3 125.36 Ge\ ′ <i>H</i> product	H decaying to inv fb ^{-1} at 8 TeV, and / and assumes the s ions. The upper lim	4.7 fb ^{—1} at 7 Standard Mode	TeV. The quoted lin rates for gluon fu	nit is given sion, VBF,	NODE=S126R01;LINKA	.GE=L
³³ AAD 140 se 4.5 fb ⁻¹ at branching ra	earch for p_{f} $E_{cm} = 7$ atio is given	$p \rightarrow HZX, Z \rightarrow$ TeV and 20.3 fb ⁻ n for $m_{H} = 125.5$ C	$\ell \ell$, with <i>H</i> decal at $E_{\sf cm}=8$ GeV and assume	ying to invisible fin TeV. The quoted li s the Standard Mo	al states in mit on the del rate for	NODE=S126R01;LINKA	GE=A
<i>qqHX</i> with quoted limit	YAN 14B set the H decayin the on the br the H. It is g	earch for $pp \rightarrow HZ$ ong to invisible final s ranching ratio is obtiven for $m_H = 125$	tates using data ained from a c	at E _{cm} = 7 and 8 combination of the	3 TeV. The limits from	NODE=S126R01;LINKA	GE=B
35 CHATRCHY and $Z \rightarrow \ell$	$AN 14B set \ell \ell in 4.9 fb$	earch for $pp \rightarrow H$ p^{-1} at $E_{cm} = 7$ Te fb ⁻¹ at $E_{cm} = 8$	V and 19.7 fb $^-$	$^{-1}$ at $E_{\rm cm}=$ 8 TeV	∕, and also	NODE=S126R01;LINKA	GE=CH
is given for	$m_{H} = 125$	5 GeV and assumes	the Standard M	odel rate for <i>HZ</i> p	roduction.		
to invisible ing ratio is production.	final states given for <i>r</i>	earch for $pp \rightarrow q$ in 19.5 fb ⁻¹ at E_{c} $m_{H} = 125$ GeV and	m = 8 TeV. The sum of the second s	oson fusion) with h le quoted limit on t Standard Model rat	he branch- e for qqH	NODE=S126R01;LINKA	GE=C
$\Gamma(\gamma \text{ invisible})$	/F _{total}	DOCUMENT ID	TECN	COMMENT	Г ₃₂ /Г	NODE=S126R15 NODE=S126R15	
<0.029	95	^{1,2} SIRUNYAN	21L CMS	VBF, HZ , $H \rightarrow 7$ ble, 13 TeV	γ + invisi-	OCCUR=2	
		following data for av			visible 12		
< 0.035	95	¹ SIRUNYAN ³ SIRUNYAN	21L CMS	VBF, $H \rightarrow \gamma + \text{ in}$ TeV			
< 0.046	95		19cg CMS	$\begin{array}{c} p p \rightarrow HZ, H \rightarrow \\ \text{ible, } Z \rightarrow \ell\ell, \end{array}$	13 TeV		
¹ SIRUNYAN	21L search	n for H decaying to	an invisible fin	al state plus a γ i	n the VBF	NODE=S126R15;LINKA	GE=B

¹SIRUNYAN 21L search for *H* decaying to an invisible final state plus a γ in the VBF production using 130 fb⁻¹ data at $E_{\rm cm} = 13$ TeV. The invisible state is called a dark photon. The quoted limit on the branching ratio is given for $m_H = 125$ GeV assuming the Standard Model rates. ² The result of the VBF production is combined with the $pp \rightarrow HZ$ result (SIRUN-YAN 19cc)

YAN 19CG).

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NODE=S126R15;LINKAGE=A

³SIRUNYAN 19CG search for $pp \rightarrow HZ$, $Z \rightarrow ee$, $\mu\mu$ with H decaying to invisible final states plus a γ in 137 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The quoted limit on the branching ratio is given for $m_{H} = 125$ GeV assuming the Standard Model rate for HZ production and is obtained in the context of a theoretical model, where the undetected (invisible) particle is massless.

H SIGNAL STRENGTHS IN DIFFERENT CHANNELS

The H signal strength in a particular final state xx is given by the cross section times branching ratio in this channel normalized to the Standard Model (SM) value, $\sigma \cdot B(H \rightarrow xx) / (\sigma \cdot B(H \rightarrow xx))_{SM}$, for the specified mass value of H. For the SM predictions, see DITTMAIER 11, DITTMAIER 12, and HEINEMEYER 13A. Results for fiducial and differential cross sections are also listed below.

Combined Final States				NODE=S126SA
VALUE 1.03 ±0.04 OUR AVERA	<u>DOCUMENT ID</u>	<u>TECN</u>	COMMENT	NODE=S126SA
1.05 ±0.06	¹ ATLAS	22 ATLS	<i>рр</i> , 13 ТеV	
1.002 ± 0.057	² CMS	22 CMS	<i>pp</i> , 13 TeV	
$1.09 \ \pm 0.07 \ \pm 0.04 {+0.08 \atop -0.07}$	^{3,4} AAD	16AN LHC	<i>pp</i> , 7, 8 TeV	
$\substack{1.44 + 0.59 \\ -0.56}$	⁵ AALTONEN	13M TEVA	$p\overline{p} ightarrow$ HX , 1.96 TeV	
$\bullet \bullet \bullet$ We do not use the feature	ollowing data for averages	, fits, limits, e	tc. ● ● ●	
$1.11 \ \begin{array}{c} +0.09 \\ -0.08 \end{array}$	⁶ AAD	20 ATLS	<i>рр</i> , 13 ТеV	
1.17 ±0.10	⁷ SIRUNYAN ⁸ SIRUNYAN	19ат CMS 19ва CMS	pp, 13 TeV pp, 13 TeV, diiferential cross sections	
$1.20 \ \pm 0.10 \ \pm 0.06 {+0.09 \atop -0.08}$	⁴ AAD	16AN ATLS	<i>рр</i> , 7, 8 ТеV	OCCUR=2
$0.97 \ \pm 0.09 \ \pm 0.05 {+0.08 \atop -0.07}$	⁴ AAD	16AN CMS	<i>pp</i> , 7, 8 TeV	OCCUR=3
$1.18 \ \pm 0.10 \ \pm 0.07 {+0.08 \atop -0.07}$	⁹ AAD	16K ATLS	<i>pp</i> , 7, 8 TeV	
$\begin{array}{cccc} 0.75 & +0.28 & +0.13 + 0.08 \\ & -0.26 & -0.11 - 0.05 \end{array}$	⁹ AAD	16K ATLS	<i>рр</i> , 7 ТеV	OCCUR=2
$1.28 \ \pm 0.11 \ \begin{array}{c} +0.08 + 0.10 \\ -0.07 - 0.08 \end{array}$	⁹ AAD	16K ATLS	<i>рр</i> , 8 ТеV	OCCUR=3
	¹⁰ AAD	15P ATLS	<i>pp</i> , 8 TeV, cross sec- tion	
$1.00 \ \pm 0.09 \ \pm 0.07 {+0.08 \atop -0.07}$	¹¹ KHACHATRY.	15AM CMS	<i>pp</i> , 7, 8 TeV	
$\begin{array}{ccc} 1.33 & +0.14 \\ -0.10 & \pm 0.15 \end{array}$	¹² AAD	13AK ATLS	<i>pp</i> , 7 and 8 TeV	
$1.54 \ \begin{array}{c} +0.77 \\ -0.73 \end{array}$	¹³ AALTONEN	13L CDF	$p \overline{p} ightarrow HX$, 1.96 TeV	
$1.40 \begin{array}{c} +0.92 \\ -0.88 \end{array}$	¹⁴ ABAZOV	13L D0	$p \overline{p} ightarrow HX$, 1.96 TeV	
1.4 ±0.3	¹⁵ AAD	12AI ATLS	$pp \rightarrow HX$, 7, 8 TeV	
1.2 ± 0.4	¹⁵ AAD	12AI ATLS	$pp \rightarrow HX$, 7 TeV	OCCUR=2
1.5 ± 0.4	¹⁵ AAD	12AI ATLS	$pp \rightarrow HX$, 8 TeV	OCCUR=3
0.87 ±0.23	¹⁶ CHATRCHYAN		$pp \rightarrow HX$, 7, 8 TeV	
fb ^{—1} of data at E _{cm} cross-sections, branchir	pined results (see their Ex $=13~{ m TeV}$, assuming m_H ng fractions and several ra	= 125.09 Ge tios are found	V. The Higgs production in their Figs. 2 and 3.	NODE=S126SA;LINKAGE=J
² CMS 22 report combin data at $E_{\rm cm} = 13$ TeV modes and decay chan	ed results (see their Extended results (see their Extended, assuming $m_{H} = 125.3$ nels are found in their Fig	nded Data Tal 8 GeV. Signal . 2.	ble 2) using 138 fb ⁻¹ of strengths for production	NODE=S126SA;LINKAGE=I
SAAD 16AN perform fits	to the ATLAS and CMS of	lata at <i>E</i> _{cm} =	= 7 and 8 IeV. The signal 1.10 ± 0.25	NODE=S126SA;LINKAGE=F
strengths for individual	production processes are 3 , $0.89 \stackrel{+0.40}{-} 0.38$ for <i>W H</i> prod	1.03 - 0.14 for	gluon fusion, $1.18 - 0.23$ -0.38 for 7 μ production	
and $2.3^{+0.7}_{-0.6}$ for $t\bar{t}H$			0.36	
	tainties represent statistics	experimenta	l systematics and added	
in quadrature theory s signal strengths are give	ystematics on the backgr en for $m_{H} = 125.09$ GeV. as sections are fixed to the	round and on In the fit, rela	the signal. The quoted ative branching ratios and	NODE=S126SA;LINKAGE=G
⁵ AALTONEN 13M comb up to 10.0 fb ⁻¹ and 9	bine all Tevatron data from 0.7 fb^{-1} , respectively, of μ	n the CDF an p collisions a	d D0 Collaborations with t $E_{\rm cm} = 1.96$ TeV. The	NODE=S126SA;LINKAGE=AT
quoted signal strength	is given for $m_{H}=125~{ m Ge}$ ts of up to 79.8 fb $^{-1}$ of c	ev. data at E	- 13 Tol/ accuming m	
$=$ 125.09 GeV: $\gamma\gamma$, ZZ	The formation of the f	nvisible, and of	ff-shell analyses (see their	NODE=S126SA;LINKAGE=H

NODE=S126230

NODE=S126230

NODE=S126SA;LINKAGE=D

NODE=S126SA;LINKAGE=E

NODE=S126SA;LINKAGE=B

NODE=S126SA;LINKAGE=C

NODE=S126SA;LINKAGE=A

NODE=S126SA:LINKAGE=LH

NODE=S126SA;LINKAGE=LL

NODE=S126SA;LINKAGE=AB

NODE=S126SA;LINKAGE=AA

NODE=S126SA:LINKAGE=CA

fusion, $1.21^{+0.24}_{-0.22}$ for vector boson fusion, $1.30^{+0.40}_{-0.38}$ for *WH* production, $1.05^{+0.31}_{-0.29}$ for ZH production, and $1.21^{+0.26}_{-0.24}$ for $t\bar{t}H+tH$ production (see their Fig. 2 and Table IV). Several results with the simplified template cross section and κ -frameworks are presented: see their Figs. 9–11, Figs 20, 21 and Table VIII for stage-1 simplified template cross sections, their Figs. 12–17 and Tables X–XII for the κ -framework.

⁷ SIRUNYAN 19AT combine results of 35.9 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV, assuming $m_H = 125.09$ GeV. The signal strengths for individual production processes are 1.22 + 0.14 = -0.12for gluon fusion, $0.73^{+0.30}_{-0.27}$ for vector boson fusion, $2.18^{+0.58}_{-0.55}$ for *WH* production, $0.87^{+0.44}_{-0.42}$ for Z H production, and $1.18^{+0.30}_{-0.27}$ for $t\bar{t}H$ production. Several results with the simplified template cross section and κ -frameworks are presented: see their Fig. 8 and Table 5 for stage-0 simplified template cross sections, their Figs. 9-18 and Tables 7–11 for the κ -framework.

 8 SIRUNYAN 19BA measure differential cross sections for the Higgs boson transverse momentum, the number of jets, the rapidity of the Higgs boson and the transverse momentum of the leading jet using 35.9 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV with $H \rightarrow \gamma \gamma$, $H \rightarrow$ ZZ^* , and $H \rightarrow b\overline{b}$. The total cross section for Higgs boson production is measured to be 61.1 \pm 6.0 \pm 3.7 pb using H $\rightarrow~\gamma\gamma$ and H $\rightarrow~ZZ^{*}$ channels. Several coupling measurements in the $\kappa\text{-}\mathsf{framework}$ are performed.

⁹AAD 16K use up to 4.7 fb⁻¹ of *pp* collisions at $E_{cm} = 7$ TeV and up to 20.3 fb⁻¹ at $E_{cm} = 8$ TeV. The third uncertainty in the measurement is theory systematics. The signal strengths for individual production modes are $1.23 \pm 0.14 + 0.09 + 0.16$ for gluon fusion, 1.23 + 0.28 + 0.13 + 0.11 for vector boson fusion, $0.80 + 0.31 \pm 0.17 + 0.10$ for W/ZH production, and 1.81 + 0.52 + 0.58 + 0.31 for $t\bar{t}H$ production. The quoted signal strengths are given for $m_H = 125.36$ GeV.

 $^{10}\,{\rm AAD}$ 15P measure total and differential cross sections of the process $p\,p$ \rightarrow $\,$ HX at $E_{\rm cm}$ = 8 TeV with 20.3 fb⁻¹. $\gamma\gamma$ and 4 ℓ final states are used. $\sigma(pp \rightarrow HX)$ = 33.0 \pm 5.3 \pm 1.6 pb is given. See their Figs. 2 and 3 for data on differential cross sections

¹¹KHACHATRYAN 15AM use up to 5.1 fb⁻¹ of *pp* collisions at $E_{\rm cm}$ = 7 TeV and up to 19.7 fb⁻¹ at $E_{\rm cm}$ = 8 TeV. The third uncertainty in the measurement is theory systematics. Fits to each production mode give the value of $0.85 \substack{+0.19 \\ -0.16}$ for gluon fusion, $1.16^{+0.37}_{-0.34}$ for vector boson fusion, $0.92^{+0.38}_{-0.36}$ for *W H*, *Z H* production, and $2.90^{+1.08}_{-0.94}$ for $t \overline{t} H$ production.

 12 AAD 13AK use 4.7 fb $^{-1}$ of pp collisions at $E_{\rm cm}$ = 7 TeV and 20.7 fb $^{-1}$ at $E_{\rm cm}$ = 8 TeV. The combined signal strength is based on the $\gamma\gamma$, $ZZ^* \rightarrow 4\ell$, and $WW^* \rightarrow$ $\ell \nu \ell \nu$ channels. The quoted signal strength is given for $m_{H}=$ 125.5 GeV. Reported statistical error value modified following private communication with the experiment.

¹³AALTONEN 13L combine all CDF results with 9.45–10.0 fb⁻¹ of $p\overline{p}$ collisions at E_{cm} = 1.96 TeV. The quoted signal strength is given for $m_H = 125$ GeV.

¹⁴ABAZOV 13L combine all D0 results with up to 9.7 fb⁻¹ of $p\overline{p}$ collisions at E_{cm} = 1.96 TeV. The quoted signal strength is given for $m_H = 125$ GeV.

 15 AAD 12AI obtain results based on 4.6–4.8 fb $^{-1}$ of pp collisions at $E_{\rm cm}$ = 7 TeV and 5.8–5.9 fb⁻¹ at $E_{\rm cm} = 8$ TeV. An excess of events over background with a local significance of 5.9 σ is observed at $m_H = 126$ GeV. The quoted signal strengths are given for $m_H = 126$ GeV. See also AAD 12DA.

¹⁶CHATRCHYAN 12N obtain results based on 4.9–5.1 fb⁻¹ of pp collisions at $E_{\rm cm}=7$ TeV and 5.1–5.3 fb⁻¹ at $E_{\rm cm}$ = 8 TeV. An excess of events over background with a local significance of 5.0 σ is observed at about m_H = 125 GeV. The combined signal strength is based on the $\gamma\gamma$, ZZ*, WW*, $\tau^+\tau^-$, and $b\overline{b}$ channels. The quoted signal strength is given for $m_H = 125.5$ GeV. See also CHATRCHYAN 13Y.

WW* Final State

WW* Final State	DOCUMENT ID		TECN	COMMENT		NODE=S126SWW NODE=S126SWW
1.00 ± 0.08 OUR AVERAG	E					
$0.97 \!\pm\! 0.09$	¹ CMS	22	CMS	<i>pp</i> , 13 TeV		
$1.09\substack{+0.18\\-0.16}$	^{2,3} AAD	16an	LHC	<i>pp</i> , 7, 8 TeV		
$0.94 \substack{+ \ 0.85 \\ - \ 0.83}$	⁴ AALTONEN	13M	TEVA	$p\overline{p} ightarrow$ HX , 1.96 TeV		
$\bullet \bullet \bullet$ We do not use the f	ollowing data for aver	ages, fi	ts, limit	ts, etc. ● ● ●		
	⁵ AAD ⁶ AAD			<i>pp</i> , 13 TeV, cross sections <i>pp</i> , 13 TeV, cross sections		
$0.95\substack{+\ 0.10\\-\ 0.09}$	^{7,8} TUMASYAN	23W	CMS	<i>pp</i> , 13 TeV	I	
$0.92 \substack{+0.11 \\ -0.10}$	^{7,9,10} TUMASYAN	23W	CMS	<i>pp</i> , 13 TeV	I	OCCUR=2
$0.71^{+0.28}_{-0.25}$	7,9,11 TUMASYAN					OCCUR=3
$2.2 \hspace{0.1in} \pm 0.6$	^{7,9,12} TUMASYAN	23W	CMS	<i>рр</i> , 13 ТеV		OCCUR=4

2.0 ±0.7 7,	^{9,13} TUMASYAN ^{7,14} TUMASYAN	23w CMS 23w CMS	<i>рр</i> , 13 TeV <i>рр</i> , 13 TeV	OCCUR=5 OCCUR=6
$\begin{array}{ccc} 0.5 & \pm 0.4 & +0.7 \\ & -0.6 \end{array}$	¹⁵ AAD	22V ATLS	pp, $WW^* (ightarrow e u \mu u) +2j$, 13 TeV	
	¹⁶ AAD	22v ATLS	pp, $WW^*~(ightarrow~e u\mu u)$	OCCUR=2
	¹⁷ AABOUD	19F ATLS	+2j, 13 TeV pp, 13 TeV, cross sections	
$2.5 \begin{array}{c} +0.9 \\ -0.8 \end{array}$	¹⁸ AAD	19A ATLS	$pp ightarrow HW/HZ, H ightarrow W^*, 13 TeV$	
$1.28 \substack{+0.17 \\ -0.16}$	¹⁹ SIRUNYAN	19AT CMS	<i>pp</i> , 13 TeV	
$1.28 \substack{+0.18 \\ -0.17}$	²⁰ SIRUNYAN	19AX CMS	<i>рр</i> , 13 ТеV	
$1.22^{+0.23}_{-0.21}$	³ AAD	16AN ATLS	<i>рр</i> , 7, 8 ТеV	OCCUR=2
$0.90 \substack{+0.23 \\ -0.21}$	³ AAD	16AN CMS	<i>рр</i> , 7, 8 ТеV	OCCUR=3
0.22	²¹ AAD	16A0 ATLS	pp, 8 TeV, cross sections	
$1.18 {\pm} 0.16 {+} 0.17 {-} 0.14$	²² AAD	16K ATLS	<i>рр</i> , 7, 8 ТеV	
$1.09 \substack{+0.16 + 0.17 \\ -0.15 - 0.14}$	²³ AAD	15AA ATLS	<i>рр</i> , 7, 8 ТеV	
$3.0 \begin{array}{c} +1.3 \\ -1.1 \end{array} \begin{array}{c} +1.0 \\ -0.7 \end{array}$	²⁴ AAD	15AQ ATLS	$pp \rightarrow HW/ZX$, 7, 8	
$1.16 +0.16 + 0.18 \\ -0.15 - 0.15 \ -0.15 \$	²⁵ AAD	15AQ ATLS	ТеV рр, 7, 8 ТеV	OCCUR=2
$0.72 \pm 0.12 \pm 0.10 \stackrel{+0.12}{-0.10}$	²⁶ CHATRCHYAI	N14G CMS	<i>рр</i> , 7, 8 ТеV	
$0.99^{+0.31}_{-0.28}$	²⁷ AAD	13AK ATLS	<i>pp</i> , 7 and 8 TeV	
$0.00 + 1.78 \\ - 0.00$	²⁸ AALTONEN	13L CDF	$p \overline{p} ightarrow HX$, 1.96 TeV	
$1.90^{+1.63}_{-1.52}$	²⁹ ABAZOV	13L D0	$p \overline{p} ightarrow H X$, 1.96 TeV	
1.3 ± 0.5	³⁰ AAD	12AI ATLS	pp ightarrow HX, 7, 8 TeV	
0.5 ± 0.6	³⁰ AAD ³⁰ AAD		$pp \rightarrow HX$, 7 TeV	OCCUR=2
$\begin{array}{rrr} 1.9 & \pm 0.7 \\ 0.60 {+}0.42 \\ -0.37 \end{array}$	³⁰ AAD ³¹ CHATRCHYAI	12AI ATLS N12N CMS	pp ightarrow HX, 8 TeV pp ightarrow HX, 7, 8 TeV	OCCUR=3
			Fable 2) using up to 138 fb $^{-1}$	NODE=S126SWW;LINKAGE=O
of data at $E_{ m cm}=13$ TeV	/, assuming $m_H =$	125.38 GeV. S	See their Fig. 2 right.	
strengths for individual pr	oduction processes	are 0.84 \pm 0.1	$_{ m m}=$ 7 and 8 TeV. The signal 17 for gluon fusion, 1.2 ± 0.4	NODE=S126SWW;LINKAGE=I
		oduction, 5.9	+2.6 for <i>ZH</i> production, and -2.2	
$5.0^{+1.8}_{-1.7}$ for $t\bar{t}H$ product ³ AAD 16AN ¹ In the fit rela		s sections are t	fixed to those in the Standard	NODE=S126SWW;LINKAGE=J
Model. The quoted signa	l strength is given f	or $m_H = 125$.09 GeV.	
⁴ AALTONEN 13M combin up to 10.0 fb ^{-1} and 9.7	e all Tevatron data fb^{-1} , respectively,	from the CDF of pp collisio	⁻ and D0 Collaborations with ns at $E_{ m cm}=1.96$ TeV. The	NODE=S126SWW;LINKAGE=AT
quoted signal strength is ⁵ AAD 23AP measure cros	given for $m_{H} = 12$ s-sections times the	5 GeV. $e H \rightarrow W N$	\prime^* branching fraction in the	NODE=S126SWW;LINKAGE=P
$H ightarrow WW^* ightarrow e u \mu u$	channel using 139	${\rm fb}^{-1}$ of pp of	collisions at $E_{\rm cm} = 13$ TeV:	
$\sigma_{ggF} \times B(H \rightarrow WW^*)$	$= 12.0 \pm 1.4$ pb, σ	$VBF \times B(H -$	$\rightarrow WW^*) = 0.75 \substack{+0.19 \\ -0.16}$ pb,	
125.09 GeV. Measured c	ross sections and ra	atios to the SI	e results are given for $m_H =$ M predictions in the reduced	
their Table VII and Fig. 1	.5.		tion framework are shown in	
⁶ AAD 23BV measure fiduc	ial total and differer	ntial cross sect	tions of VBF process at $E_{\rm cm}$	NODE=S126SWW;LINKAGE=Z
cross section is 1.68 ± 0 Section V). See their Fig differential cross sections the Warsaw basis at 95%	$.33(stat)\pm0.23(system)$. 9 for the comparate shown in their l	t) fb in their rison with the Figs. 11, 12, a	The measured total fiducial fiducial region (Table II and ory predictions. The fiducial and 13. Wilson coefficients in d; see their Table V and Fig.	
16. ⁷ TUMASYAN 23W measur	e Higgs production	rates with H -	$ ightarrow ~WW^{st}$ at $E_{ m cm}=$ 13 TeV	NODE=S126SWW;LINKAGE=Q
with 138 fb $^{-1}$ data. The	quoted results are	given for <i>m</i> _H	= 125.38 GeV.	

with 138 tb⁻¹ data. The quoted results are given for $m_H = 125.38$ GeV. ⁸ The quoted global signal strength is obtained assuming the relative ratios of different Higgs production modes fixed to the SM values. 9 The A size the second strength is a strength in the second strength in the second strength is a strength in the second strength in the second strength is a strength in the second strength in the second strength is a strength in the second strength in the second strength is a strength in the second strength in the second strength is a strength in the second strength in the second strength is a strength in the second strength

⁹ The 4 signal strengths for gluon-fusion (ggF), VBF, WH and ZH modes are fit assuming $t\bar{t}H$ and $b\bar{b}H$ fixed to the SM values. ¹⁰ The quoted result is for ggF production mode. ¹¹ The quoted result is for VBF production mode.

NODE=S126SWW;LINKAGE=T

NODE=S126SWW;LINKAGE=R

NODE=S126SWW;LINKAGE=V NODE=S126SWW;LINKAGE=U

 12 The quoted result is for WH production mode. NODE=S126SWW;LINKAGE=W 13 The quoted result is for *ZH* production mode. NODE=S126SWW;LINKAGE=X 14 Measured cross sections and ratios to the SM predictions in the reduced stage-1.2 (see NODE=S126SWW;LINKAGE=Y their Fig. 17) simplified template cross section framework (6 ggF, 4 VBF, and 4 VH) are shown in their Table 18 and Fig. 26. 15 AAD 22V measure the signal strength for ggF+2jets with 36.1 fb $^{-1}$ data at 13 TeV. NODE=S126SWW;LINKAGE=M 16 AAD 22V probe the Higgs couplings to longitudinally and transversely polarized WNODE=S126SWW;LINKAGE=N and Z using VBF ($H \rightarrow WW^* \rightarrow e \nu \mu \nu$ plus two jets) with 36.1 fb $^{-1}$ of data at $E_{\rm cm} = 13$ TeV. The ratios of the polarization-dependent couplings $g_{HV_LV_L}$ and $g_{HV_TV_T}$ to the Higgs-V coupling predicted by the SM, $a_L = g_{HV_LV_L}/g_{HVV}^{SM}$ and $a_T = g_{HV_TV_T}/g_{HVV}^{SM}$ are measured to be $0.91^{+0.10}_{-0.18} + 0.012_{-0.18}$ and $1.2 \pm 0.4^{+0.2}_{-0.3}$, respectively, assuming the standard Hgg coupling. These measurements are translated into pseudo-observables of κ_{VV} and ϵ_{VV} : $\kappa_{VV} = 0.91 \substack{+0.10 + 0.09 \\ -0.18 - 0.17}$ and $\epsilon_{VV} =$ $0.13 \substack{+0.28 + 0.08 \\ -0.20 - 0.10}$, where $\kappa_{VV} = 1$ and $\epsilon_{VV} = 0$ for the SM. See their Tables 9 and 10. ¹⁷ AABOUD 19F measure cross-sections times the $H \rightarrow WW^*$ branching fraction in the $H \rightarrow WW^* \rightarrow e\nu\mu\nu$ channel using 36.1 fb⁻¹ of *pp* collisions at $E_{\rm cm} = 13$ NODE=S126SWW;LINKAGE=F $\text{TeV: } \sigma_{ggF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.1} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.2} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.2} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.2} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.2} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.2} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.2} + \frac{1.8}{1.6} \text{ pb and } \sigma_{VBF} \times \text{B}(H \rightarrow WW^*) = 11.4^{+1.2}_{-1.2} + \frac{1.8}{1.6} + \frac{1$ $0.50^{+0.24}_{-0.22} \pm 0.17$ pb. 18 AAD 19A use 36.1 fb⁻¹ data at 13 TeV. The cross section times branching fraction values NODE=S126SWW;LINKAGE=L are measured to be $0.67 \stackrel{+0.31}{-} \stackrel{+0.18}{-} \text{pb}$ for WH, $H \rightarrow WW^*$ and $0.54 \stackrel{+0.31}{-} \stackrel{+0.15}{-} \stackrel{+0.11}{-} \stackrel{+0.12}{-} \stackrel{$ pb for ZH, $H \rightarrow WW^*$. $^{19}\,{\rm SIRUNYAN}$ 19AT perform a combine fit to 35.9 fb $^{-1}$ of data at $E_{\rm cm}=$ 13 TeV. NODE=S126SWW;LINKAGE=G 20 SIRUNYAN 19AX measure the signal strengths, cross sections and so on using gluon NODE=S126SWW;LINKAGE=K fusion, VBF and VH production processes with 35.9 fb⁻¹ of data. The quoted signal strength is given for $m_H = 125.09$ GeV. Signal strengths for each production process is found in their Fig. 9. Measured cross sections and ratios to the SM predictions in the stage-0 simplified template cross section framework are shown in their Fig. 10. κ_F = $1.52 \substack{+0.48\\-0.41}$ and $\kappa_{\pmb{V}} = 1.10 \pm 0.08$ are obtained (see their Fig. 11 (right)). 21 AAD 16AO measure fiducial total and differential cross sections of gluon fusion process NODE=S126SWW;LINKAGE=H at $E_{\rm cm}=8~{\rm TeV}$ with 20.3 fb $^{-1}$ using $H \rightarrow WW^* \rightarrow e \nu \mu \nu$. The measured fiducial total cross section is 36.0 ± 9.7 fb in their fiducial region (Table 7). See their Fig. 6 for fiducial differential cross sections. The results are given for $m_H = 125$ GeV. ²² AAD 16K use up to 4.7 fb⁻¹ of *pp* collisions at $E_{\rm cm} =$ 7 TeV and up to 20.3 fb⁻¹ at $E_{\rm cm} =$ 8 TeV. The quoted signal strength is given for $m_H =$ 125.36 GeV. NODE=S126SWW:LINKAGE=E ²³ AAD 15AA use 4.5 fb⁻¹ of pp collisions at $E_{\rm cm} = 7$ TeV and 20.3 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The signal strength for the gluon fusion and vector boson fusion mode is $1.02 \pm 0.19 + 0.22$ and 1.27 + 0.44 + 0.30, respectively. The quoted signal strengths are given for $m_{\rm cm} = 125.36$ GeV. NODE=S126SWW;LINKAGE=B given for $m_H = 125.36$ GeV. ²⁴AAD 15AQ use 4.5 fb⁻¹ of *pp* collisions at $E_{\rm cm} = 7$ TeV and 20.3 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The quoted signal strength is given for $m_H = 125.36$ GeV. NODE=S126SWW;LINKAGE=C 25 AAD 15AQ combine their result on W/ZH production with the results of AAD 15AA NODE=S126SWW;LINKAGE=D (gluon fusion and vector boson fusion, slightly updated). The quoted signal strength is given for $m_H = 125.36$ GeV. ²⁶ CHATRCHYAN 14G use 4.9 fb⁻¹ of *pp* collisions at $E_{cm} = 7$ TeV and 19.4 fb⁻¹ at $E_{cm} = 8$ TeV. The last uncertainty in the measurement is theory systematics. The NODE=S126SWW;LINKAGE=A quoted signal strength is given for $m_H = 125.6$ GeV. ²⁷ AAD 13AK use 4.7 fb⁻¹ of *pp* collisions at $E_{cm} = 7$ TeV and 20.7 fb⁻¹ at $E_{cm} = 8$ TeV. The quoted signal strength is given for $m_H = 125.5$ GeV. Superseded by AAD 15AA. NODE=S126SWW;LINKAGE=LH ²⁸AALTONEN 13L combine all CDF results with 9.45–10.0 fb⁻¹ of $p\overline{p}$ collisions at E_{cm} NODE=S126SWW:LINKAGE=LL = 1.96 TeV. The quoted signal strength is given for $m_H = 125$ GeV. 29 ABAZOV 13L combine all D0 results with up to 9.7 fb $^{-1}$ of $p\overline{p}$ collisions at $E_{\rm cm}=$ 1.96 TeV. The quoted signal strength is given for $m_{H}=$ 125 GeV. NODE=S126SWW;LINKAGE=AB $^{30}\,\rm AAD$ 12Al obtain results based on 4.7 fb $^{-1}$ of $\it pp$ collisions at $\it E_{\rm cm}$ = 7 TeV and 5.8 NODE=S126SWW;LINKAGE=AA fb⁻¹ at $E_{\rm cm} = 8$ TeV. The quoted signal strengths are given for $m_{\rm H} = 126$ GeV. See also AAD 12DA. 31 CHATRCHYAN 12N obtain results based on 4.9 fb $^{-1}$ of pp collisions at $E_{
m cm}=$ 7 TeV NODE=S126SWW;LINKAGE=CA and 5.1 fb⁻¹ at $E_{\rm cm}$ = 8 TeV. The quoted signal strength is given for m_{H} = 125.5 GeV. See also CHATRCHYAN 13Y. ZZ* Final State NODE=S126SZZ =S126SZZ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT	NODE=S12
1.02±0.08 OUR AVE		DOCOMENT ID		TECN	COMMENT	NODL=312
$0.97^{+0.12}_{-0.11}$		1 CMS	22	CMS	<i>pp</i> , 13 TeV	
1.01 ± 0.11		^{2,3} AAD	20AG	ATLS	<i>рр</i> , 13 ТеV	OCCUR=3
$1.29^{+0.26}_{-0.23}$		^{4,5} AAD	16AN	LHC	<i>рр</i> , 7, 8 ТеV	

 \bullet \bullet \bullet We do not use the following data for averages, fits, limits, etc. \bullet \bullet

	ne tonowi	⁶ HAYRAPETY		pp, 13 TeV cross sec-	1
		⁷ SIRUNYAN	21AE CMS	tions pp, 13 TeV, couplings	
$0.94\!\pm\!0.07\!+\!0.09\\-0.08$		⁸ SIRUNYAN	21s CMS	<i>pp</i> , 13 TeV	
0.00		^{2,9} AAD 10 _{AAD}	20AQ ATLS 20BA ATLS	pp, 13 TeV pp, 13 TeV cross sec-	OCCUR=2
<6.5	95	¹¹ AABOUD	19N ATLS	tions pp, 13 TeV, off-shell	
$1.06 \substack{+0.19 \\ -0.17}$		¹² SIRUNYAN	19AT CMS	<i>рр</i> , 13 ТеV	
$1.28 \substack{+0.21 \\ -0.19}$		¹³ AABOUD	18AJ ATLS	<i>pp</i> , 13 TeV	
<3.8	95	¹⁴ AABOUD	18BP ATLS	pp, 13 TeV, off-shell	
$1.05\substack{+0.15}{-0.14}\substack{+0.11}{-0.09}$		¹⁵ SIRUNYAN	17AV CMS	<i>рр</i> , 13 ТеV	
$1.52^{+0.40}_{-0.34}$		⁵ AAD	16AN ATLS	<i>рр</i> , 7, 8 ТеV	OCCUR=2
$1.04 \substack{+0.32 \\ -0.26}$		⁵ AAD	16AN CMS	<i>рр</i> , 7, 8 ТеV	OCCUR=3
$1.46\substack{+0.35+0.19\\-0.31-0.13}$		16 _{AAD}	16к ATLS	<i>pp</i> , 7, 8 TeV	
		¹⁷ KHACHATRY	16AR CMS	pp, 7, 8 TeV cross sec- tions	
$1.44 \substack{+0.34 + 0.21 \\ -0.31 - 0.11}$		¹⁸ AAD	15F ATLS	pp ightarrow HX, 7, 8 TeV	
0.01 0.11		¹⁹ AAD	14ar ATLS	pp, 8 TeV, cross sec- tions	
$0.93 \substack{+0.26 + 0.13 \\ -0.23 - 0.09}$		²⁰ CHATRCHYA	N 14AA CMS	<i>рр</i> , 7, 8 ТеV	
$1.43 \substack{+0.40 \\ -0.35}$		²¹ AAD	13AK ATLS	<i>pp</i> , 7 and 8 TeV	
$0.80 \substack{+0.35 \\ -0.28}$		²² CHATRCHYA	N 13J CMS	pp ightarrow HX, 7, 8 TeV	
1.2 ± 0.6		²³ AAD	12AI ATLS	pp ightarrow HX, 7, 8 TeV	
1.4 ± 1.1		²³ AAD		pp ightarrow HX, 7 TeV	OCCUR=2
1.1 ± 0.8		²³ AAD		pp ightarrow HX, 8 TeV	OCCUR=3
$0.73 \substack{+0.45 \\ -0.33}$		²⁴ CHATRCHYA	N12N CMS	pp ightarrow HX, 7, 8 TeV	
¹ CMS 22 report com				e 2) using up to 138 fb ^{-1}	NODE=S126SZZ;LINKAGE=S

CMS 22 report combined results (see their Extended Data Table 2) using up to 138 fb of data at $E_{\rm cm} = 13$ TeV, assuming $m_{H} = 125.38$ GeV. See their Fig. 2 right.

 2 AAD 20AQ perform analyses using $H o ~Z Z^* o ~4\ell~(\ell=e,~\mu)$ with data of 139 fb $^{-1}$ at $E_{\rm cm} = 13$ TeV. Results are given for $m_H = 125$ GeV.

³AAD 20AQ measured the inclusive cross section times branching ratio for $H \rightarrow ZZ^*$ decay (|y(H)| < 2.5) to be 1.34 \pm 0.12 pb (with 1.33 \pm 0.08 pb expected in the SM). ⁴AAD 16AN perform fits to the ATLAS and CMS data at $E_{\rm cm} = 7$ and 8 TeV. The signal strengths for individual production processes are $1.13^{+0.34}_{-0.31}$ for gluon fusion and $0.1^{+1.1}_{-0.6}$ for vector boson fusion.

 5 AAD 16AN: In the fit, relative production cross sections are fixed to those in the Standard Model. The quoted signal strength is given for $m_H = 125.09$ GeV.

- ⁶HAYRAPETYAN 23 measure the cross sections for $pp \rightarrow H \rightarrow ZZ^* \rightarrow 4\ell$ ($\ell = e$, μ) using 138 fb⁻¹ at $E_{\rm cm}=$ 13 TeV. They give $\sigma=$ 2.73 \pm 0.22(stat) \pm 0.15(syst) fb in their fiducial region (see their Section5 and Table 2), where 2.86 \pm 0.15 fb is expected in the Standard Model for $m_{H} = 125.38$ GeV. 26 differential and 6 double-differential cross sections are given; see their Figs. 6-23 and 24-25.
- ⁷SIRUNYAN 21AE obtains constraints on anomalous couplings to vector bosons (W, Z, and gluon) and top quark using $H \rightarrow ZZ^* \rightarrow 4\ell$ ($\ell = e, \mu$) with data of 137 fb⁻¹ at $E_{\rm cm} = 13$ TeV. Their Table 5 and Figs 14–17 show (effective) couplings to gluon and top with combining gluon fusion, $t\bar{t}H$ and tH production channels and the result of $t\bar{t}H$, $H \rightarrow \gamma\gamma$ (SIRUNYAN 20AS). Their Tables 6–9 and Figs 18–22 show couplings to W and Z for different assumptions and bases (Higgs and Warsaw).
- $^8\,{\sf SIRUNYAN}$ 21S measure cross sections with the $H \rightarrow~Z\,Z^* \rightarrow~4\ell~(\ell=e,~\mu)$ channel using 137 fb⁻¹ data at $E_{\rm cm} = 13$ TeV. Results are given for $m_{H} = 125.38$ GeV. The signal strengths for individual production processes in their Table 4. Cross sections are given in their Table 6 and Fig. 14, which are based on the simplified template cross section framework (reduced stage-1.2).
- 9 AAD 20AQ present several results for the channel $H o ~Z Z^* o ~4\ell~(\ell=e,~\mu)$ with the simplified template cross section with κ -frameworks and the effective field theory (EFT) approach; see their Table 8 and Fig. 10 for simplified template cross sections. $\kappa_V =$ 1.02 ± 0.06 and $\kappa_{F}=0.88\pm0.16$ are obtained, see their Fig. 12 for the κ -framework. See their Tables 9 and 10 and Figs. 16-18 for the EFT-framework.
- 10 AAD 20BA measure the cross section for $\it p\,p \rightarrow~H \rightarrow~Z\,Z^* \rightarrow~4\ell~(\ell=e,~\mu)$ using 139 fb⁻¹ at $E_{\rm cm}$ = 13 TeV. They give $\sigma \cdot B$ = 3.28 ± 0.30 ± 0.11 fb in their fiducial region, where 3.41 ± 0.18 fb is expected in the Standard Model for m_H = 125 GeV.

NODE=S126SZZ;LINKAGE=M

NODE=S126SZZ;LINKAGE=O

NODE=S126SZZ;LINKAGE=P

NODE=S126SZZ;LINKAGE=Q

NODE=S126SZZ;LINKAGE=G

NODE=S126SZZ;LINKAGE=H

NODE=S126SZZ;LINKAGE=T

NODE=S126S77 LINKAGE=N

NODE=S126SZZ;LINKAGE=R

NODE=S126SZZ;LINKAGE=K

NODE=S126SZZ;LINKAGE=J

NODE=S126SZZ;LINKAGE=F

NODE=S126SZZ;LINKAGE=L

NODE=S126SZZ;LINKAGE=E

NODE=S126SZZ;LINKAGE=D

NODE=S126SZZ;LINKAGE=I

NODE=S126SZZ;LINKAGE=B

NODE=S126SZZ;LINKAGE=C

NODE=S126SZZ;LINKAGE=A

NODE=S126SZZ;LINKAGE=LH

NODE=S126SZZ;LINKAGE=CA

NODE=S126SZZ;LINKAGE=AA

NODE=S126SZZ:LINKAGE=CH

Various differential cross sections are also given; see their Figs. 19-39. Constraints on Yukawa couplings for bottom and charm quarks are given in their Table 9 and Fig. 41.

 $^{11}\textsc{AABOUD}$ 19N measure the spectrum of the four-lepton invariant mass $\textsc{m}_{4\ell}$ (ℓ = e or $\mu)$ using 36.1 fb $^{-1}$ of data at $E_{\rm cm}$ = 13 TeV. The quoted signal strength upper limit is obtained from 180 GeV $< m_{4\ell}$ < 1200 GeV.

 $^{12}\,\rm SIRUNYAN$ 19AT perform a combine fit to 35.9 fb $^{-1}$ of data at $E_{\rm cm}$ = 13 TeV.

- ¹³AABOUD 18AJ perform analyses using $H \rightarrow ZZ^* \rightarrow 4\ell$ ($\ell = e, \mu$) with data of 36.1 fb^{-1} at $E_{cm} = 13$ TeV. Results are given for $m_H = 125.09$ GeV. The inclusive cross section times branching ratio for H $ightarrow~ZZ^{*}$ decay ($\left|\eta(H)
 ight|~<$ 2.5) is measured to be $1.73^{+0.26}_{-0.24}$ pb (with $1.34^{+0.09}_{-0.09}$ pb expected in the SM).
- $^{14}\,{\sf AABOUD}\,18{\sf BP}$ measure an off-shell Higgs boson production using $Z\,Z\to\,4\ell$ and $Z\,Z\to$ $2\ell 2\nu$ ($\ell = e, \mu$) decay channels with 36.1 fb⁻¹ of data at $E_{cm} = 13$ TeV. The quoted signal strength upper limit is obtained from a combination of these two channels, where 220 GeV < $m_{4\ell}$ < 2000 GeV for $ZZ \rightarrow 4\ell$ and 250 GeV < m_T^{ZZ} < 2000 GeV for $ZZ \rightarrow 2\ell 2\nu$ (m_T^{ZZ} is defined in their Section 5). See their Table 2 for each
- measurement. ¹⁵ SIRUNYAN 17AV use 35.9 fb⁻¹ of pp collisions at $E_{cm} = 13$ TeV. The quoted signal strength, obtained from the analysis of $H \rightarrow ZZ^* \rightarrow 4\ell$ ($\ell = e, \mu$) decays, is given for $m_H = 125.09$ GeV. The signal strengths for different production modes are given in
- for $m_H = 125.09$ GeV. The signal strengths for different production modes are given in their Table 3. The fiducial and differential cross sections are shown in their Fig. 10. ¹⁶ AAD 16K use up to 4.7 fb⁻¹ of *pp* collisions at $E_{\rm cm} = 7$ TeV and up to 20.3 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The quoted signal strength is given for $m_H = 125.36$ GeV. ¹⁷ KHACHATRYAN 16AR use data of 5.1 fb⁻¹ at $E_{\rm cm} = 7$ TeV and 19.7 fb⁻¹ at 8 TeV. The fiducial cross sections for the production of 4 leptons via $H \rightarrow 4\ell$ decays are measured to be 0.56 + 0.67 + 0.21 fb at 7 TeV and 1.11 + 0.41 + 0.14 fb at 8 TeV in their fiducial region (Table 2). The differential cross sections at $E_{\rm cm} = 8$ TeV are also shown in Figs. 4 and 5. The results are given for $m_H = 125$ GeV. ¹⁸ AAD 15F up 4.5 fb⁻¹ of pa collisions at $E_{\rm cm} = 7$ TeV and 20.2 fb⁻¹ at $E_{\rm cm} = 8$
- ¹⁸ AAD 15F use 4.5 fb⁻¹ of *pp* collisions at $E_{cm} = 7$ TeV and 20.3 fb⁻¹ at $E_{cm} = 8$ TeV. The quoted signal strength is given for $m_H = 125.36$ GeV. The signal strength for the gluon fusion production mode is 1.66 + 0.45 + 0.25, while the signal strength for the -0.41 0.15, while the signal strength for the vector boson fusion production mode is 0.26 + 1.60 + 0.36-0.91 - 0.23.
- ¹⁹AAD 14AR measure the cross section for $pp \rightarrow H \rightarrow ZZ^* \rightarrow 4\ell$ ($\ell = e, \mu$) using 20.3fb⁻¹ at $E_{\rm cm} = 8$ TeV. They give $\sigma \cdot B = 2.11 + 0.53 \pm 0.08$ fbin their fiducial region, where 1.30 \pm 0.13 fb is expected in the Standard Model for m_{H} = 125.4 GeV. Various differential cross sections are also given; see their Fig. 2.
- ²⁰ CHATRCHYAN 14AA use 5.1 fb⁻¹ of *pp* collisions at $E_{cm} = 7$ TeV and 19.7 fb⁻¹ at $E_{cm} = 8$ TeV. The quoted signal strength is given for $m_H = 125.6$ GeV. The signal strength for the gluon fusion and $t\bar{t}H$ production mode is $0.80^{+0.46}_{-0.36}$, while the signal strength for the vector boson fusion and WH, ZH production mode is $1.7^{+2.2}_{-2.1}$.
- 21 AAD 13AK use 4.7 fb $^{-1}$ of pp collisions at $E_{\rm cm}$ = 7 TeV and 20.7 fb $^{-1}$ at $E_{\rm cm}$ = 8 TeV. The quoted signal strength is given for m_{H} = 125.5 GeV.
- $^{22}\,{\rm CHATRCHYAN}$ 13J obtain results based on $ZZ \rightarrow ~$ 4 ℓ final states in 5.1 fb $^{-1}$ of ppcollisions at $E_{\rm cm} = 7$ TeV and 12.2 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The quoted signal strength is given for $m_{\rm H} = 125.8$ GeV. Superseded by CHATRCHYAN 14AA.
- ²³ AAD 12AI obtain results based on 4.7–4.8 fb⁻¹ of pp collisions at $E_{\rm cm}=$ 7 TeV and 5.8 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The quoted signal strengths are given for $m_{\rm H} = 126$ GeV. See also AAD 12DA.
- 24 CHATRCHYAN 12N obtain results based on 4.9–5.1 fb $^{-1}$ of pp collisions at $E_{\rm cm}=7$ TeV and 5.1–5.3 fb⁻¹ at $E_{\rm cm}$ = 8 TeV. An excess of events over background with a local significance of 5.0 σ is observed at about m_{H} = 125 GeV. The quoted signal strengths are given for m_{H} = 125.5 GeV. See also CHATRCHYAN 12BY and CHATRCHYAN 13Y.

$\gamma\gamma$ Final State

VALUE	DOCUMENT ID	TECN	COMMENT	
1.10±0.06 OUR AVERAGE [1.10±0.07 OUR 2023 A				
$1.04 \substack{+0.10 \\ -0.09}$	¹ AAD	23Y ATLS	<i>рр</i> , 13 ТеV	
$1.13 {\pm} 0.09$	² CMS	22 CMS	<i>рр</i> , 13 ТеV	
$1.14 \substack{+0.19 \\ -0.18}$	^{3,4} AAD	16AN LHC	<i>pp</i> , 7, 8 TeV	
$5.97^{+3.39}_{-3.12}$	⁵ AALTONEN	13M TEVA	$p \overline{p} ightarrow HX$, 1.96 TeV	

NODE=S126SGG NODE=S126SGG NEW

We do not use the following data for averages, fits, limits, etc.

1.12±0.09	⁶ TUMASYAN ⁷ AAD ⁸ SIRUNYAN		 <i>pp</i>, 13 TeV, cross sections <i>pp</i>, 13 TeV, diff. x-sections <i>pp</i>, 13 TeV 	I
	⁹ SIRUNYAN	19AT CM		
$1.20^{+0.18}_{-0.14}$			1117	
	¹⁰ SIRUNYAN	19L CM	5 pp, 13 TeV, diff. x-section	
$0.99 \substack{+0.15 \\ -0.14}$	¹¹ AABOUD	18BO ATL	S pp, 13 TeV	
$1.18 \substack{+0.17 \\ -0.14}$	¹² SIRUNYAN	18DS CM	5 pp, $H \rightarrow \gamma \gamma$, 13 TeV, floated m_H	
$1.14 \substack{+0.27 \\ -0.25}$	⁴ AAD	16AN ATL	S <i>pp</i> , 7, 8 TeV	OCCUR=2
$1.11^{+0.25}_{-0.23}$	⁴ AAD	16AN CM	б <i>рр</i> , 7, 8 ТеV	OCCUR=3
	¹³ KHACHATRY.	16G CM	5 pp, 8 TeV, diff. x-section	
$1.17 \!\pm\! 0.23 \! \substack{+0.10 + 0.12 \\ -0.08 - 0.08}$	¹⁴ AAD	14BC ATL		
	¹⁵ AAD	14bj ATL	S pp, 8 TeV, diff. x-section	
$1.14\!\pm\!0.21\!+\!0.09\!+\!0.13\\-0.05\!-\!0.09$	¹⁶ KHACHATRY.	14P CM	5 <i>pp</i> , 7, 8 TeV	
$1.55^{+0.33}_{-0.28}$	¹⁷ AAD	13ak ATL	S <i>pp</i> , 7 and 8 TeV	
$7.81^{+4.61}_{-4.42}$	¹⁸ AALTONEN	13L CDF	$p \overline{p} ightarrow HX$, 1.96 TeV	
$4.20 \substack{+4.60 \\ -4.20}$	¹⁹ ABAZOV	13L D0	$p \overline{p} ightarrow HX$, 1.96 TeV	
1.8 ± 0.5	²⁰ AAD	12AI ATL	S $pp \rightarrow HX$, 7, 8 TeV	
2.2 ± 0.7	²⁰ AAD	12ai ATL	S $pp \rightarrow HX$, 7 TeV	OCCUR=2
1.5 ± 0.6	²⁰ AAD	12ai ATL	S $pp ightarrow HX$, 8 TeV	OCCUR=3
$1.54^{+0.46}_{-0.42}$	²¹ CHATRCHYAN	12N CM	$5 \hspace{0.2cm} p \hspace{0.2cm} p \hspace{0.2cm} ightarrow \hspace{0.2cm} HX$, 7, 8 TeV	
1 AAD 2214 120 ft-1			12 T-1/ The must of model to and	1

¹AAD 23Y use 139 fb⁻¹ of *pp* collisions at $E_{\rm cm} = 13$ TeV. The quoted results are given for $m_{H} = 125.09$ GeV and $\Gamma_{H} = 4.07$ MeV. Measured $\sigma \cdot B$ and ratios to the SM predictions for the different production modes are shown in their Table 9 and Fig. 9. Measured cross sections and ratios to the SM predictions in the reduced stage-1.2 (see their Fig. 11) simplified template cross section framework are shown in their Table 10 and Fig. 12. Wilson coefficients in the Warsaw basis (see their Table 11) at 95% CL are measured; see their Table 16 and Fig. 17.

measured; see their Table 10 and Fig. 17. ²CMS 22 report combined results (see their Extended Data Table 2) using up to 138 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV, assuming $m_H = 125.38$ GeV. See their Fig. 2 right. ³AAD 16AN perform fits to the ATLAS and CMS data at $E_{\rm cm} = 7$ and 8 TeV. The signal strengths for individual production processes are $1.10^{+0.23}_{-0.22}$ for gluon fusion, 1.3 ± 0.5 for vector boson fusion, $0.5^{+1.3}_{-1.2}$ for WH production, $0.5^{+3.0}_{-2.5}$ for ZH production, and $2.2^{+1.6}_{-1.3}$ for $t\bar{t}H$ production.

- ⁴ AAD 16AN: In the fit, relative production cross sections are fixed to those in the Standard Model. The quoted signal strength is given for $m_H = 125.09$ GeV.
- ⁵AALTONEN 13M combine all Tevatron data from the CDF and D0 Collaborations with up to 10.0 fb⁻¹ and 9.7 fb⁻¹, respectively, of $p\bar{p}$ collisions at $E_{\rm cm} = 1.96$ TeV. The quoted signal strength is given for $m_H = 125$ GeV.
- $^{6}\,\rm{TUMASYAN}$ 23Q measure fiducial and differential cross sections at $\rm{\it E}_{cm}=$ 13 TeV with 137 fb⁻¹ data. The quoted results are given for $m_H = 125.38$ GeV. The inclusive fiducial $\sigma \cdot B$ is 73.4 + 5.4 (stat) + 2.4 (syst) fb with their defined fiducial region (see their Section 7 and Table 2), where 75.4 \pm 4.1 fb is expected in the Standard Model. See their Fig. 8 including other fiducial $\sigma \cdot B$ defined in their Table 3. Differential $\sigma \cdot B$ are shown in their Figs. 10–15. Double-differential $\sigma \cdot B$ are in their Figs. 16 and 17.
- ⁷ AAD 22N measure fiducial and differential cross sections of $pp
 ightarrow H
 ightarrow \gamma \gamma$ at $E_{
 m cm} =$ 13 TeV with 139 fb⁻¹ data. The quoted results are given for $m_H = 125.09$ GeV. The inclusive fiducial $\sigma \cdot B$ is 67 \pm 5 \pm 4 fb with their defined fiducial region. Other fiducial $\sigma \cdot B$ are in their Table 3. Differential $\sigma \cdot B$ are shown in their Figs. 8–13, 15, 25–32, 35, 36. Double-differential $\sigma \cdot B$ are in their Figs. 14, 33, 34. Modifications of the *b*- and *c*-quark Yukawa couplings to *H*, κ_b and κ_c at 95% CL are in their Table 6 and Fig. 18. Wilson coefficients at 95% CL are in their Table 7 and Fig. 21.
- 8 SIRUNYAN 210 measures cross sections and couplings with the $H o ~\gamma \gamma$ channel using 137 fb⁻¹ data at $E_{\rm cm} = 13$ TeV. Results are given for $m_{H} = 125.38$ GeV. The signal strengths for individual production processes are given in their Fig. 16. Cross sections are given in their Tables 12 and 13 and Figs. 18 and 20, which are based on the simplified template cross section framework (reduced stage-1.2). Results in the κ -framework are given in their Fig. 22.

 $^9\,{\rm SIRUNYAN}$ 19AT perform a combine fit to 35.9 fb $^{-1}$ of data at $E_{\rm cm}=$ 13 TeV.

 $^{10}\,{\sf SIRUNYAN}$ 19L measure fiducial and differential cross sections of the process $p\,p$ \rightarrow $H \rightarrow \gamma \gamma$ at $E_{\rm cm} = 13$ TeV with 35.9 fb⁻¹. See their Figs. 4–11.

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¹¹AABOUD 18BO use 36.1 fb⁻¹ of pp collisions at $E_{cm} = 13$ TeV. The signal strengths for the individual production modes are: $0.81^{+0.19}_{-0.18}$ for gluon fusion, $2.0^{+0.6}_{-0.5}$ for vector boson fusion, $0.7^{+0.9}_{-0.8}$ for VH production (V = W, Z), and 0.5 ± 0.6 for $t\bar{t}H$ and tH production. Other measurements of cross sections and couplings are summarized in their Section 10. The quoted values are given for $m_H = 125.09$ GeV.

- ¹² SIRUNYAN 18DS use 35.9 fb⁻¹ of $pp \rightarrow H$ collisions with $H \rightarrow \gamma \gamma$ at $E_{\rm cm} = 13$ TeV. The Higgs mass is floated in the measurement of a signal strength. The result is 1.18 + 0.12 (stat.) + 0.09 (syst.) + 0.07 (theory), which is largely insensitive to the Higgs mass of 125 CeV. mass around 125 GeV.
- ^{mass} around 125 GeV. ¹³ KHACHATRYAN 16G measure fiducial and differential cross sections of the process $pp \rightarrow$ HX, H $\rightarrow \gamma \gamma$ at $E_{\rm cm}=$ 8 TeV with 19.7 fb⁻¹. See their Figs. 4–6 and Table 1 for
- data. ¹⁴ AAD 14BC use 4.5 fb⁻¹ of pp collisions at $E_{cm} = 7$ TeV and 20.3 fb⁻¹ at $E_{cm} = 8$ TeV. The last uncertainty in the measurement is theory systematics. The quoted signal strength is given for $m_H = 125.4$ GeV. The signal strengths for the individual production modes are: 1.32 ± 0.38 for gluon fusion, 0.8 ± 0.7 for vector boson fusion, 1.0 ± 1.6 for WH production, $0.1^{+3.7}_{-0.1}$ for ZH production, and $1.6^{+2.7}_{-1.8}$ for $t\bar{t}H$ production.
- 15 AAD 14BJ measure fiducial and differential cross sections of the process $pp \rightarrow HX$, $H \rightarrow \gamma \gamma$ at $E_{\rm cm} = 8$ TeV with 20.3 fb⁻¹. See their Table 3 and Figs. 3–12 for data. ¹⁶KHACHATRYAN 14P use 5.1 fb⁻¹ of pp collisions at $E_{\rm cm} = 7$ TeV and 19.7 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The last uncertainty in the measurement is theory systematics. The quoted signal strength is given for $m_H = 124.7$ GeV. The signal strength for the gluon fusion and $t\bar{t}H$ production mode is $1.13^{+0.37}_{-0.31}$, while the signal strength for the vector boson fusion and WH, ZH production mode is $1.16 \substack{+0.63\\-0.58}$
- ¹⁷AAD 13AK use 4.7 fb⁻¹ of pp collisions at $E_{\rm cm} = 7$ TeV and 20.7 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The quoted signal strength is given for $m_H = 125.5$ GeV.
- 18 AALTONEN 13L combine all CDF results with 9.45–10.0 fb $^{-1}$ of $p\overline{p}$ collisions at $E_{\rm cm}$ = 1.96 TeV. The quoted signal strength is given for $m_H = 125$ GeV.
- ¹⁹ABAZOV 13L combine all D0 results with up to 9.7 fb⁻¹ of $p\overline{p}$ collisions at $E_{\rm cm}$ = 1.96 TeV. The quoted signal strength is given for $m_H = 125$ GeV.
- 20 AAD 12AI obtain results based on 4.8 fb $^{-1}$ of pp collisions at $E_{\rm cm}$ = 7 TeV and 5.9 fb^{-1} at $E_{cm} = 8$ TeV. The quoted signal strengths are given for $m_H = 126$ GeV. See also AAD 12DA. 21 CHATRCHYAN 12N obtain results based on 5.1 fb⁻¹ of pp collisions at E_{cm} =7 TeV
- and 5.3 fb⁻¹ at $E_{\rm cm}$ =8 TeV. The quoted signal strength is given for m_{H} =125.5 GeV. See also CHATRCHYAN 13Y.

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VAL	UE		<u>CL%</u>	DOCUMENT ID	TECN	COMMENT	
<	14	(CL = 95%	%) [<1	110 (CL = 95%) OU	R 2020 BEST	LIMIT]	
<	14		95	¹ TUMASYAN	23AH CMS	$pp \rightarrow WH/ZH$, 13 TeV	
• •	• We	e do not use	the foll	owing data for avera	ges, fits, limit	s, etc. ● ● ●	
	9.4	$4^{+20.3}_{-19.9}$		² TUMASYAN	23AD CMS	$pp \rightarrow WH/ZH$	I
<	47		95	² TUMASYAN	23AD CMS	(boosted), 13 TeV $pp \rightarrow WH/ZH$ (boosted), 13 TeV	
- - <	- 9 26	$\begin{array}{ccc} \pm 10 & \pm 11 \\ \pm 10 & \pm 12 \end{array}$	95	^{3,4} AAD ^{3,5} AAD ³ AAD	22W ATLS	$pp \rightarrow WH/ZH$, 13 TeV $pp \rightarrow WH/ZH$, 13 TeV $pp \rightarrow WH/ZH$, 13 TeV $pp \rightarrow WH/ZH$, 13 TeV	1
	37	$\pm 17 \ +11 \ -9$		⁶ SIRUNYAN	20AE CMS	<i>pp</i> , 13 TeV	
<	110	-	95	⁷ AABOUD	18M ATLS	<i>pp</i> , 13 TeV	
1				<pre></pre>	() (·	

¹TUMASYAN 23AH search for V H, $H \rightarrow c \overline{c} (V = W, Z)$ using 138 fb⁻¹ of pp collision data at $E_{\rm cm} = 13$ TeV. The upper limit on $\sigma(pp \rightarrow VH) \cdot B(H \rightarrow c\overline{c})$ is 0.94 pb at 95% CL. See their Fig. 4. The quoted values are given for $m_H = 125.38$ GeV.

 2 TUMASYAN 23AD search for Higgs produced with transverse momenta greater than 450

GeV and decaying to $c\bar{c}$ using 138 fb⁻¹ of pp collision data at $E_{\rm cm} = 13$ TeV. ³AAD 22W search for VH, $H \rightarrow c\bar{c}$ (V = W, Z) using 139 fb⁻¹ of pp collision data at $E_{\rm cm} = 13$ TeV. The results are given for $m_H = 125$ GeV.

⁴ The analysis of V H, $H \rightarrow c \overline{c}$ is combined with V H, $H \rightarrow b \overline{b}$ (AAD 21AB). The ratio $|\kappa_c/\kappa_b|$ is constrained to be less than 4.5 at 95% CL. See their Fig. 7.

⁵ The constraint on the charm Yukawa coupling modifier κ_c is measured to be $|\kappa_c|$ <8.5 at 95% CL. See their Fig. 4.

⁶SIRUNYAN 20AE use 35.9 fb⁻¹ at of pp collisions at $E_{\rm cm} = 13$ TeV. The measured best fit value of $\sigma(pp \rightarrow VH) \cdot B(H \rightarrow c\bar{c})$ is $2.40^{+1.12}_{-1.11} + 0.65$ pb (equivalent to < 4.5 pb at 95% CL upper limit, i.e. 70 times the standard model), where V is $W \rightarrow \ell \nu$, $Z \rightarrow \ell \ell$, or $Z \rightarrow \nu \nu \nu (\ell = e, \mu)$. The quoted values are given for $m_H = 125$ GeV.

⁷AABOUD 18M use 36.1 fb⁻¹ at of *pp* collisions at $E_{\rm cm} = 13$ TeV. The upper limit on $\sigma(pp \rightarrow ZH) \cdot B(H \rightarrow c\overline{c})$ is 2.7 pb at 95% CL. This corresponds to 110 times the standard model. The quoted values are given for $m_H = 125$ GeV.

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bb Final State	DOCUMENT ID	<u></u>	ECN	COMMENT	NODE=S126S NODE=S126S
0.99 ± 0.12 OUR AV					
1.05 + 0.22 - 0.21	¹ CMS	22 C	CMS	<i>рр</i> , 13 ТеV	
$1.02^{+0.12}_{-0.11}^{+0.14}_{-0.13}$	² AAD	21ab A		$pp \rightarrow HW/HZ, H \rightarrow b\overline{b},$ 13 TeV, 139 fb ⁻¹	
$0.95 \pm 0.32 \substack{+0.20 \\ -0.17}$	³ AAD	21aj A	TLS	VBF, $H ightarrow b \overline{b}$, pp, 13 TeV, 126 fb $^{-1}$	
$0.70^{+0.29}_{-0.27}$	^{4,5} AAD	16an LI	.HC	<i>pp</i> , 7, 8 TeV	
$1.59\substack{+0.69 \\ -0.72}$	⁶ AALTONEN	13M T	EVA	$p \overline{p} ightarrow HX$, 1.96 TeV	
	the following data for av	-			
0.8 ±3.2	⁷ AAD	22X A	ATES	boosted $H \rightarrow b \overline{b}$, pp, 13 TeV	
$0.95 \pm 0.18 \substack{+0.19 \\ -0.18}$	² AAD	21ab A	TLS	$p p ightarrow HW, H ightarrow b\overline{b}, 13$ TeV, 139 fb ⁻¹	OCCUR=2
$1.08 {\pm} 0.17 {+} 0.18 {-} 0.15$	² AAD	21ab A	TLS	$pp ightarrow HZ, H ightarrow b\overline{b}, 13$ TeV, 139 fb ⁻¹	OCCUR=3
$0.72^{+0.29}_{-0.28}{}^{+0.26}_{-0.22}$	⁸ AAD	21H A	TLS	$pp \rightarrow HW/HZ, H \rightarrow b\overline{b},$ boosted W/Z , 13 TeV, 139 fb ⁻¹	
$1.3 \hspace{0.1 in} \pm 1.0$	⁹ AAD	21M A	TLS	VBF+ γ , $H \rightarrow b\overline{b}$, pp , 13 TeV, 132 fb ⁻¹	
$3.7 \ \pm 1.2 \ {}^{+0.11}_{-0.9}$	¹⁰ SIRUNYAN	20BL C	CMS	boosted $H \rightarrow b\overline{b}$, pp , 13	
	11 AABOUD	19∪ A	TLS	$\begin{array}{c} \text{TeV} \\ pp \rightarrow VH, H \rightarrow b\overline{b}, 13 \\ T \rightarrow VH, H \rightarrow D\overline{b}, 13 \end{array}$	
1.12 ± 0.29	¹² SIRUNYAN	19AT C	CMS	TeV, cross sections pp, 13 TeV	
$1.16^{+0.27}_{-0.25}$	¹³ AABOUD	18bn A	TLS	$pp ightarrow HW/HZ, H ightarrow b\overline{b},$ 13 TeV, 79.8 fb $^{-1}$	
$0.98 \substack{+0.22 \\ -0.21}$	¹⁴ AABOUD	18bn A	TLS	$pp \rightarrow HW/HZ, H \rightarrow b\overline{b},$	OCCUR=2
1.01 ± 0.20	¹⁵ AABOUD	18bn A	TLS	7, 8, 13 TeV $pp \rightarrow HX$, ggF, VBF, VH, $t\overline{t}H$ 7, 8, 13 TeV	OCCUR=3
$2.5 \ +1.4 \ -1.3$	^{16,17} AABOUD	18bq A	TLS	$pp \rightarrow HX$, VBF, ggF, VH, $t\bar{t}H$, 13 TeV	
$3.0 \ +1.7 \ -1.6$	16,18 AABOUD	18bq A	TLS	pp ightarrow HX, VBF, 13 TeV	OCCUR=2
210	¹⁹ AALTONEN	18C C	DF	$p\overline{p} ightarrow HX$, 1.96 TeV	
$1.19\substack{+0.40\\-0.38}$	²⁰ SIRUNYAN	18ae C	CMS	$pp \rightarrow HW/HZ, H \rightarrow b\overline{b},$	
$1.06\substack{+0.31 \\ -0.29}$	²¹ SIRUNYAN	18ae C	CMS	13 TeV $pp \rightarrow HW/HZ, H \rightarrow b\overline{b},$	OCCUR=2
-0.29 1.06 \pm 0.26	²² SIRUNYAN	18db C		7, 8, 13 TeV $pp \rightarrow HW/HZ, H \rightarrow b\overline{b},$	
1.01 ± 0.22	²³ SIRUNYAN	18db C	CMS	13 TeV, 77.2 fb ⁻¹ $pp \rightarrow HW/HZ, H \rightarrow b\overline{b},$	OCCUR=2
1.04 ± 0.20	²⁴ SIRUNYAN	18db C	CMS	7, 8, 13 TeV $pp \rightarrow HX$, ggF, VBF, VH, $t\bar{t}H$ 7, 8, 13 TeV	OCCUR=3
$2.3 \ +1.8 \ -1.6$	²⁵ SIRUNYAN	18E C	CMS	$pp \rightarrow HX$, boosted, 13 TeV	
$1.20^{+0.24}_{-0.23}{}^{+0.34}_{-0.23}$	²⁶ AABOUD	17ba A	TLS	$pp ightarrow HW/ZX, H ightarrow b\overline{b},$ 13 TeV, 36.1 fb ⁻¹	
$0.90 \!\pm\! 0.18 \!+\! 0.21 \\ - 0.19$	²⁷ AABOUD	17ba A	TLS	$pp ightarrow HW/ZX, H ightarrow b\overline{b},$ 7, 8, 13 TeV	OCCUR=2
$0.8 \hspace{.1in} \pm 1.3 \hspace{.1in} {}^{+1.8}_{-1.9}$	²⁸ AABOUD	16X A	TLS	pp ightarrow HX, VBF, 8 TeV	
0.62±0.37	⁵ AAD	16an A		<i>рр</i> , 7, 8 ТеV	OCCUR=2
$0.81 \substack{+0.45 \\ -0.43}$	⁵ AAD	16an C	CMS	рр, 7, 8 TeV	OCCUR=3
$0.63^{+0.31}_{-0.30}{}^{+0.24}_{-0.23}$	²⁹ AAD	16K A	TLS	<i>рр</i> , 7, 8 ТеV	
$0.52 \pm 0.32 \pm 0.24$	³⁰ AAD	15G A		$pp \rightarrow HW/ZX$, 7, 8 TeV	
$2.8\begin{array}{c}+1.6\\-1.4\end{array}$	³¹ KHACHATRY.	15z C	CMS	pp ightarrow HX, VBF, 8 TeV	
$1.03 \substack{+0.44 \\ -0.42}$	³² KHACHATRY.	15z C	CMS	<i>pp</i> , 8 TeV, combined	OCCUR=2
$1.0 \hspace{0.1in} \pm 0.5$	³³ CHATRCHYA	N14AI C	CMS	p p ightarrow H W / Z X, 7, 8 TeV	
$1.72^{+0.92}_{-0.87}$	³⁴ AALTONEN	13L C	DF	$p\overline{p} ightarrow HX$, 1.96 TeV	

$1.23^{+1.24}_{-1.17}$	³⁵ ABAZOV	13L D0	$p\overline{p} ightarrow$ HX, 1.96 TeV
0.5 ± 2.2	³⁶ AAD	12AI ATLS	$pp \rightarrow HW/ZX$, 7 TeV
	³⁷ AALTONEN	12T TEVA	$p\overline{p} ightarrow HW/ZX$, 1.96 TeV
$0.48 \substack{+0.81 \\ -0.70}$	³⁸ CHATRCHYAI	N12N CMS	$pp \rightarrow HW/ZX$, 7, 8 TeV

¹ CMS 22 report combined results (see their Extended Data Table 2) using up to 138 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV, assuming $m_H = 125.38$ GeV. See their Fig. 2 right. ² AAD 21AB search for $VH, H \rightarrow b\bar{b}$ (V = W, Z) using 139 fb⁻¹ of pp collision data at $E_{\rm cm} = 13$ TeV. The results are given for $m_H = 125$ GeV. Cross sections are given in their Table 12 and 50 m $T_{\rm cm}$ and $T_{\rm cm} = 13$ TeV. in their Table 13 and Fig. 7, which are based on the simplified template cross section framework (reduced stage-1.2). Wilson coefficients of the Warsaw-basis operators are given in their Fig. 9.

- ³AAD 21AJ present measurements of $H \rightarrow b\overline{b}$ in the VBF production mode. The inclusive VBF cross sections with and without the branching ratio of $H \rightarrow b \, \overline{b}$ are $2.07\pm0.70^{+0.46}_{-0.37}$ fb and $3.56\pm1.21^{+0.80}_{-0.64}$ fb, respectively. The latter is obtained assuming the SM value of B(H $\rightarrow b \overline{b}$) = 0.5809 and m_H = 125 GeV.
- ⁴ AAD 16AN perform fits to the ATLAS and CMS data at $E_{\rm cm}=$ 7 and 8 TeV. The signal strengths for individual production processes are 1.0 \pm 0.5 for WH production, 0.4 \pm 0.4 for ZH production, and 1.1 ± 1.0 for $t\bar{t}H$ production.
- 5 AAD 16AN: In the fit, relative production cross sections are fixed to those in the Standard Model. The quoted signal strength is given for $m_H = 125.09$ GeV.
- 6 AALTONEN 13M combine all Tevatron data from the CDF and D0 Collaborations with up to 10.0 fb $^{-1}$ and 9.7 fb $^{-1}$, respectively, of $p\overline{p}$ collisions at $E_{\rm cm}=1.96$ TeV. The quoted signal strength is given for $m_H = 125$ GeV.
- ⁷ AAD 22X measure cross sections using a boosted $H \rightarrow b \overline{b}$ with large-radius jets. The data is 136 fb⁻¹ of pp collisions at $E_{\rm cm} = 13$ TeV. All the results are given for $m_H = 125$ GeV. The inclusive signal strength is given using data with a H candidate jet $p_T > 250$ GeV. The fiducial H production cross section ($p_T(H) > 450$ GeV and |y(H)| < 2) is <115 fb (95% CL) and the upper limits for other four different p_T regions are shown in their Fig 12. The measured fiducial H production cross section $(p_T(H)>1 \text{ TeV})$ is $2.3 \pm 3.9(\text{stat}) \pm 1.3(\text{syst}) \pm 0.5(\text{theory})$ fb.
- ⁸ AAD 21H present measurements of $H o ~b\,\overline{b}$ with a boosted vector boson ($p_{\mathcal{T}}$ > 250 GeV) using 139 fb⁻¹ of pp collision data at $E_{\rm cm} =$ 13 TeV. Cross sections are given in their Table 6 and Fig. 4, which are based on the simplified template cross section framework (reduced stage-1.2). Wilson coefficients of the Warsaw-basis operators are given in their Fig. 5.
- ⁹AAD 21M search for VBF+ γ , $H \rightarrow b\overline{b}$ using 132 fb⁻¹ of pp collision data at $E_{\rm cm} =$ 13 TeV.
- ¹⁰SIRUNYAN 20BL search for boosted $H \rightarrow b \overline{b}$ (a H candidate jet p_T >450 GeV) using 137 fb⁻¹ of pp collision data at $E_{\rm cm} = 13$ TeV. The quoted signal strength corresponds to a significance of 2.5 standard deviations and is given for $m_H = 125$ GeV. A differential fiducial cross section as a function of Higgs boson p_T for ggF is shown in their Fig. 7, assuming the other production modes occur at the expected SM rates. The reported value is $3.7 \pm 1.2 + 0.8 + 0.8$ where the last uncertainty comes from theoretical modeling. We have combined the systematic uncertainties in quadrature.
- 11 AABOUD 19U measure cross sections of $pp \rightarrow VH$, $H \rightarrow b\overline{b}$ production as a function of the gauge boson transverse momentum using data of 79.8 fb $^{-1}$. The kinematic fiducial volumes used is based on the simplified template cross section framework (reduced stage-1). See their Table 3 and Fig. 3.
- $^{12}\,\rm SIRUNYAN$ 19AT perform a combine fit to 35.9 fb $^{-1}$ of data at $E_{\rm cm}$ = 13 TeV.
- ¹³AABOUD 18BN search for V H, $H \rightarrow b\overline{b}$ (V = W, Z) using 79.8 fb⁻¹ of pp collision data at $E_{\rm cm} = 13$ TeV. The quoted signal strength corresponds to a significance of 4.9 standard deviations and is given for $m_H = 125$ GeV.
- 14 AABOUD 18BN combine results of 79.8 fb $^{-1}$ at $E_{\rm cm} =$ 13 TeV with results of VH at $E_{\rm cm} = 7$ and 8 TeV.
- ¹⁵AABOUD 18BN combine results of VH at $E_{cm} = 7$, 8 and 13 TeV with results of VBF (+gluon fusion) and $t\bar{t}H$ at $E_{cm} = 7$, 8, and 13 TeV to perform a search for the $H
 ightarrow \ b \, \overline{b}$ decay. The quoted signal strength assumes a SM production strength and corresponds to a significance of 5.4 standard deviations.
- ¹⁶AABOUD 18BQ search for $H \rightarrow b\overline{b}$ produced through vector-boson fusion (VBF) and <code>VBF+ γ with 30.6 fb $^{-1}$ pp collision data at ${\it E_{cm}}=$ 13 TeV. The quoted signal strength</code> is given for $m_H = 125$ GeV.
- 17 The signal strength is measured including all production modes (VBF, ggF, VH, $t\,\bar{t}\,H).$
- 18 The signal strength is measured for VBF-only and others (ggF, V H, $t\bar{t}H$) are constrained to Standard Model expectations with uncertainties described in their Section VIII B. ¹⁹AALTONEN 18C use 5.4 fb⁻¹ of $p\overline{p}$ collisions at $E_{\rm cm}=$ 1.96 TeV. The upper limit at
- 95% CL on $p\overline{p} \rightarrow H \rightarrow b\overline{b}$ is 33 times the SM predicion, which corresponds to a cross section of 40.6 pb. $^{20}\,{\rm SIRUNYAN}$ 18AE use 35.9 fb $^{-1}$ of $p\,p$ collision data at $E_{\rm cm}$ = 13 TeV. The quoted
- signal strength corresponds to 3.3 standard deviations and is given for $m_H = 125.09$ GeV.

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NODE=S126SBB·LINKAGE=O

NODE=S126SBB;LINKAGE=P

NODE=S126SBB;LINKAGE=Q

NODE=S126SBB;LINKAGE=U NODE=S126SBB;LINKAGE=V

NODE=S126SBB;LINKAGE=W

NODE=S126SBB:LINKAGE=L

3/18/2024 16:34 Page 26 ²¹SIRUNYAN 18AE combine the result of 35.9 fb⁻¹ at $E_{\rm cm} = 13$ TeV with the results obtained from data of up to 5.1 fb⁻¹ at $E_{\rm cm} = 7$ TeV and up to 18.9 fb⁻¹ at $E_{\rm cm} = 8$ TeV (CHATRCHYAN 14AI and KHACHATRYAN 15Z). The quoted signal strength NODE=S126SBB;LINKAGE=M corresponds to 3.8 standard deviations and is given for $m_H = 125.09$ GeV. ²² SIRUNYAN 18DB search for VH, $H \rightarrow b\overline{b}$ (V = W, Z) using 77.2 fb⁻¹ of pp collision data at $E_{\rm cm} = 13$ TeV. The quoted signal strength corresponds to a significance of 4.4 standard deviations and is given for $m_H = 125.09$ GeV. NODE=S126SBB;LINKAGE=R $^{23}{\rm SIRUNYAN}$ 18DB combine the result of 77.2 fb $^{-1}$ at $E_{\rm cm}$ = 13 TeV with the results NODE=S126SBB;LINKAGE=S obtained from data of up to 5.1 fb⁻¹ at $E_{\rm cm} = 7$ TeV and up to 18.9 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The quoted signal strength corresponds to a significance of 4.8 standard deviations and is given for $m_H = 125.09$ GeV. ²⁴ SIRUNYAN 18DB combine results of 77.2 fb⁻¹ at $E_{cm} = 13$ TeV with results of gluon fusion (ggF), VBF and $t\bar{t}H$ at $E_{cm} = 7$ TeV, 8 TeV and 13 TeV to perform a search for NODE=S126SBB;LINKAGE=T the $H \rightarrow b \overline{b}$ decay. The quoted signal strength assumes a SM production strength and corresponds to a significance of 5.6 standard deviations and is given for $m_H = 125.09$ GeV. ²⁵ SIRUNYAN 18E use 35.9 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The quoted signal strength is given for $m_{\rm H} = 125$ GeV. They measure $\sigma \cdot B$ for gluon fusion production of $H \rightarrow b\overline{b}$ with NODE=S126SBB;LINKAGE=K p_T >450 GeV, $|\eta|$ <2.5 to be 74 \pm 48 $^{+17}_{-10}$ fb. ²⁶ AABOUD 17BA use 36.1 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The quoted signal strength is given for $m_{\rm H} = 125$ GeV. They give $\sigma(W \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) \cdot B(H \rightarrow b\overline{b}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) + 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) + 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) = 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) + 1.08 \substack{+0.54 \\ -0.47}$ pb and $\sigma(Z \text{ H}) = 1.08 \substack{+0.54 \\ -$ NODE=S126SBB;LINKAGE=F $b\overline{b}) = 0.57^{+0.26}_{-0.23}$ pb. $^{27}\,\mathrm{AABOUD}$ 17BA combine 7, 8 and 13 TeV analyses. The quoted signal strength is given NODE=S126SBB;LINKAGE=G for $m_H = 125$ GeV. 28 AABOUD 16X search for vector-boson fusion production of H decaying to $b\overline{b}$ in 20.2 NODE=S126SBB;LINKAGE=J fb⁻¹ of pp collisions at $E_{\rm cm}$ = 8 TeV. The quoted signal strength is given for $m_{\rm H}$ = 125 GeV. ²⁹ AAD 16K use up to 4.7 fb⁻¹ of *pp* collisions at $E_{\rm cm} = 7$ TeV and up to 20.3 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The quoted signal strength is given for $m_H = 125.36$ GeV. NODE=S126SBB;LINKAGE=E ³⁰ AAD 15G use 4.7 fb⁻¹ of *pp* collisions at $E_{\rm cm} = 7$ TeV and 20.3 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The quoted signal strength is given for $m_H = 125.36$ GeV. NODE=S126SBB;LINKAGE=B 31 KHACHATRYAN 15Z search for vector-boson fusion production of H decaying to $b\overline{b}$ in NODE=S126SBB;LINKAGE=C up to 19.8 fb⁻¹ of pp collisions at $E_{\rm cm}=$ 8 TeV. The quoted signal strength is given for $m_H = 125$ GeV. 32 KHACHATRYAN 15z combined vector boson fusion, WH, ZH production, and $t\bar{t}H$ NODE=S126SBB;LINKAGE=D production results. The quoted signal strength is given for $m_H = 125$ GeV. $^{33}\mathrm{CHATRCHYAN}$ 14AI use up to 5.1 fb $^{-1}$ of pp collisions at E_cm = 7 TeV and up to NODE=S126SBB;LINKAGE=A 18.9 fb⁻¹ at $E_{\rm cm}=$ 8 TeV. The quoted signal strength is given for $m_{H}=$ 125 GeV. See also CHATRCHYAN 14AJ. ³⁴AALTONEN 13L combine all CDF results with 9.45–10.0 fb⁻¹ of $p\overline{p}$ collisions at $E_{\rm cm}$ NODE=S126SBB;LINKAGE=LL = 1.96 TeV. The quoted signal strength is given for $m_H = 125$ GeV. 35 ABAZOV 13L combine all D0 results with up to 9.7 fb⁻¹ of $p\overline{p}$ collisions at $E_{\rm cm}=$ NODE=S126SBB;LINKAGE=AB 1.96 TeV. The quoted signal strength is given for $m_H = 125$ GeV. 36 AAD 12AI obtain results based on 4.6–4.8 fb $^{-1}$ of pp collisions at $E_{\rm cm}=$ 7 TeV. The quoted signal strengths are given in their Fig. 10 for $m_{H}=$ 126 GeV. See also Fig. 13 NODE=S126SBB:LINKAGE=AA of AAD 12DA. 37 AALTONEN 12T combine AALTONEN 12Q, AALTONEN 12R, AALTONEN 12S, NODE=S126SBB;LINKAGE=AL ABAZOV 120, ABAZOV 12P, and ABAZOV 12K. An excess of events over background is observed which is most significant in the region m_{H} = 120–135 GeV, with a local significance of up to 3.3 $\sigma.\,$ The local significance at m_{H} = 125 GeV is 2.8 $\sigma,$ which corresponds to $(\sigma(HW) + \sigma(HZ)) \cdot B(H \rightarrow b\overline{b}) = (0.23^{+0.09}_{-0.08})$ pb, compared to the Standard Model expectation at $m_H = 125$ GeV of 0.12 ± 0.01 pb. Superseded by AALTONEN 13M. ³⁸ CHATRCHYAN 12N obtain results based on 5.0 fb⁻¹ of *pp* collisions at E_{cm} =7 TeV NODE=S126SBB;LINKAGE=CA and 5.1 fb⁻¹ at $E_{\rm cm}$ =8 TeV. The quoted signal strength is given for m_H =125.5 GeV. See also CHATRCHYAN 13Y. $\mu^+\mu^-$ Final State NODE=S126SMU NODE=S126SMU

VALUE	<u>CL%_</u>	DOCUMENT ID		TECN	COMMENT	
1.21 ± 0.35 OUR A	VERAGE					
$1.21 \substack{+0.45 \\ -0.42}$		$^{1}\mathrm{CMS}$	22	CMS	<i>рр</i> , 13 ТеV	
1.2 ± 0.6		² AAD	21	ATLS	<i>рр</i> , 13 ТеV	
\bullet \bullet \bullet We do not use the	ne following	data for average	es, fits,	limits,	etc. • • •	
$1.19^{+0.40}_{-0.39}{}^{+0.15}_{-0.14}$		³ SIRUNYAN	21C	CMS	<i>pp</i> , 13 TeV	
$0.68^{+1.25}_{-1.24}$		⁴ SIRUNYAN	19 AT	CMS	<i>pp</i> , 13 TeV	
$0.7\ \pm 1.0\ +0.2\\-0.1$		⁵ SIRUNYAN	19E	CMS	<i>pp</i> , 13 TeV, 35.9 fb ⁻	-1

$1.0 \ \pm 1.0 \ \pm 0.1$		⁵ SIRUNYAN	19E CMS	<i>рр</i> , 7, 8, 13 ТеV
-0.1 ± 1.4			17Y ATLS	<i>рр</i> , 7, 8, 13 ТеV
-0.1 ± 1.5		⁶ AABOUD	17Y ATLS	<i>рр</i> , 13 ТеV
0.1 ± 2.5		⁷ AAD	16AN LHC	<i>рр</i> , 7, 8 ТеV
-0.6 ± 3.6		⁷ AAD	16AN ATLS	<i>рр</i> , 7, 8 ТеV
$0.9 \ \begin{array}{c} +3.6 \\ -3.5 \end{array}$		⁷ AAD	16AN CMS	<i>рр</i> , 7, 8 ТеV
< 7.4	95	⁸ KHACHATRY	.15н CMS	$pp \rightarrow HX$, 7, 8 TeV
< 7.0	95	⁹ AAD	14AS ATLS	$pp \rightarrow HX$, 7, 8 TeV

 $^1\,{\rm CMS}$ 22 report combined results (see their Extended Data Table 2) using up to 138 fb $^{-1}$ of data at $E_{\rm cm}$ = 13 TeV, assuming m_H = 125.38 GeV. See their Fig. 2 right.

² AAD 21 search for $H \rightarrow \mu^+ \mu^-$ using 139 fb⁻¹ of *pp* collision data at $E_{\rm cm} = 13$ TeV. The quoted signal strength corresponds to a significance of 2.0 standard deviations and is given for $m_H = 125.09$ GeV. The upper limit on the cross section times branching fraction is 2.2 times the SM prediction at 95% CL, which corresponds to the branching fraction upper limit of 4.7×10^{-4} (assuming SM production cross sections).

³ SIRUNYAN 21 search for $H \rightarrow \mu^+ \mu^-$ using 137 fb⁻¹ of *pp* collision data at $E_{\rm cm} = 13$ TeV. The quoted signal strength corresponds to a significance of 3.0 standard deviations and is given for $m_H = 125.38$ GeV.

⁴SIRUNYAN 19AT perform a combine fit to 35.9 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV.

⁵ SIRUNYAN 19E search for $H \rightarrow \mu^+ \mu^-$ using 35.9 fb⁻¹ of pp collisions at $E_{\rm cm} = 13$ TeV and combine with results of 7 TeV (5.0 fb⁻¹) and 8 TeV (19.7 fb⁻¹). The upper limit at 95% CL on the signal strength is 2.9, which corresponds to the SM Higgs boson branching fraction to a muon pair of 6.4×10^{-4} .

⁶AABOUD 17Y use 36.1 fb⁻¹ of pp collisions at $E_{\rm cm} = 13$ TeV, 20.3 fb⁻¹ at 8 TeV and 4.5 fb⁻¹ at 7 TeV. The quoted signal strength is given for $m_H = 125$ GeV.

 7 AAD 16AN: In the fit, relative production cross sections are fixed to those in the Standard Model. The quoted signal strength is given for $m_H=125.09~{\rm GeV}.$

 8 KHACHATRYAN 15H use 5.0 fb $^{-1}$ of $p\,p$ collisions at $E_{\rm cm}$ = 7 TeV and 19.7 fb $^{-1}$ at 8 TeV. The quoted signal strength is given for m_H = 125 GeV.

⁹ AAD 14AS search for $H \rightarrow \mu^+ \mu^-$ in 4.5 fb⁻¹ of pp collisions at $E_{\rm cm} = 7$ TeV and 20.3 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The quoted signal strength is given for $m_H = 125.5$ GeV.

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OCCUR=2

OCCUR=2 OCCUR=3

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NODE=S126SMU;LINKAGE=D

NODE=S126SMU;LINKAGE=B

NODE=S126SMU;LINKAGE=A

$\tau^+ \tau^-$ Final State $\frac{VALUE}{0.91 \pm 0.09}$ OUR AVERAGE	DOCUMENT ID	<u>TECN</u>	COMMENT	-	NODE=S126STT NODE=S126STT
0.85 ± 0.10	¹ CMS	22 CMS	<i>рр</i> , 13 ТеV		
$1.09 \substack{+0.18 + 0.26 + 0.16 \\ -0.17 - 0.22 - 0.11}$	² AABOUD	19AQ ATLS	<i>pp</i> , 13 TeV		
$1.11\substack{+0.24 \\ -0.22}$	^{3,4} AAD	16AN LHC	<i>pp</i> , 7, 8 TeV		
$1.68^{+2.28}_{-1.68}$	⁵ AALTONEN	13M TEVA	$p \overline{p} ightarrow HX$, 1.96 TeV		
$\bullet \bullet \bullet$ We do not use the fo	llowing data for avera	ages, fits, lim	its, etc. • • •		
$0.82\substack{+0.11 \\ -0.10}$	^{6,7} TUMASYAN	23Y CMS	<i>рр</i> , 13 ТеV	I	
$0.67\substack{+0.20 \\ -0.18}$	^{6,8} TUMASYAN	23Y CMS	<i>рр</i> , 13 ТеV	I	OCCUR=2
$0.81 \substack{+0.17 \\ -0.16}$	^{6,9} TUMASYAN	23Y CMS	<i>рр</i> , 13 ТеV	I	OCCUR=3
$1.79^{+0.47}_{-0.42}$	^{6,10} TUMASYAN	23Y CMS	<i>рр</i> , 13 ТеV	I	OCCUR=4
	¹¹ AAD ¹² TUMASYAN	22Q ATLS 22AJ CMS	рр, 13 TeV рр, 13 TeV	I.	
$2.5 \ +1.4 \ -1.3$	¹³ SIRUNYAN	19AF CMS	pp ightarrow HW/HZ, H ightarrow au, 13 TeV	_	
$1.24^{+0.29}_{-0.27}$	¹⁴ SIRUNYAN	19AF CMS	<i>pp</i> , 13 TeV		OCCUR=2
$1.02 \substack{+0.26 \\ -0.24}$	¹⁵ SIRUNYAN	19AT CMS	<i>рр</i> , 13 ТеV		
$1.09 \substack{+0.27 \\ -0.26}$	¹⁶ SIRUNYAN	18Y CMS	<i>рр</i> , 13 ТеV		
0.98 ± 0.18 2.3 ±1.6	¹⁷ SIRUNYAN ¹⁸ AAD	18Y CMS 16ac ATLS	pp, 7, 8, 13 TeV pp $ ightarrow HW/ZX$, 8 TeV		OCCUR=2
$1.41^{+0.40}_{-0.36}$	⁴ AAD	16AN ATLS	,		OCCUR=2

OCCUR=3

$0.88^{+0.30}_{-0.28}$	⁴ AAD	16AN	CMS	pp,7,	8 TeV
$1.44\substack{+0.30+0.29\\-0.29-0.23}$	¹⁹ AAD	16K	ATLS	pp,7,	8 TeV
$1.43^{+0.27}_{-0.26}{}^{+0.32}_{-0.25}{\pm}0.09$	²⁰ AAD	15ah	ATLS	pp ightarrow	<i>HX</i> , 7, 8 TeV
0.78 ± 0.27	²¹ CHATRCHYAN	14K	CMS	$pp \rightarrow$	<i>HX</i> , 7, 8 TeV
$0.00 {+8.44 \atop -0.00}$	²² AALTONEN	13L	CDF	$p\overline{p} ightarrow$	<i>HX</i> , 1.96 TeV
$3.96^{+4.11}_{-3.38}$	²³ ABAZOV	13L	D0	$p \overline{p} ightarrow$	<i>HX</i> , 1.96 TeV
$0.4 \ +1.6 \ -2.0$	²⁴ AAD	12AI	ATLS	pp ightarrow	<i>HX</i> , 7 TeV
$0.09 \substack{+0.76 \\ -0.74}$	²⁵ CHATRCHYAN	112N	CMS	pp ightarrow	<i>HX</i> , 7, 8 TeV

 1 CMS 22 report combined results (see their Extended Data Table 2) using up to 138 fb $^{-1}$ of data at $E_{\rm cm} = 13$ TeV, assuming $m_{H} = 125.38$ GeV. See their Fig. 2 right.

- 2 AABOUD 19AQ use 36.1 fb $^{-1}$ of data. The first, second and third quoted errors are statistical, experimental systematic and theory systematic uncertainties, respectively. The quoted signal strength is given for $m_H = 125$ GeV and corresponds to 4.4 standard deviations. Combining with 7 TeV and 8 TeV results (AAD 15AH), the observed significance is 6.4 standard deviations. The cross sections in the $H \rightarrow \tau \tau$ decay channel $(m_H = 125 \text{ GeV})$ are measured to $3.77^{+0.60}_{-0.59}$ (stat) $^{+0.87}_{-0.74}$ (syst) pb for the inclusive, $0.28 \pm 0.09^{+0.11}_{-0.09}$ pb for VBF, and $3.1 \pm 1.0^{+1.6}_{-1.3}$ pb for gluon-fusion production. See their Table XI for the cross sections in the framework of simplified template cross sections.
- sections. ³AAD 16AN perform fits to the ATLAS and CMS data at $E_{cm} = 7$ and 8 TeV. The signal strengths for individual production processes are 1.0 ± 0.6 for gluon fusion, 1.3 ± 0.4 for vector boson fusion, -1.4 ± 1.4 for *WH* production, $2.2^{+2.2}_{-1.8}$ for *ZH* production, and $-1.9^{+3.7}_{-3.3}$ for $t\bar{t}H$ production.

0.20

- ⁴ AAD 16AN: In the fit, relative production cross sections are fixed to those in the Standard Model. The quoted signal strength is given for $m_H = 125.09$ GeV.
- ⁵AALTONEN 13M combine all Tevatron data from the CDF and D0 Collaborations with up to 10.0 fb⁻¹ and 9.7 fb⁻¹, respectively, of $p\overline{p}$ collisions at $E_{\rm cm} = 1.96$ TeV. The quoted signal strength is given for $m_H = 125$ GeV.
- 6 TUMASYAN 23Y measure Higgs production with pp
 ightarrow H
 ightarrow au au at $E_{
 m cm} =$ 13 TeV with 138 fb⁻¹ data. The quoted results are given for $m_H = 125.38$ GeV.
- ⁷ The inclusive $\sigma \cdot B$ is $2800 + \frac{356}{-335}$ fb (see their Figs. 10 and 14). See their Fig. 15 for the 68 % and 95 % CL contours in the $\kappa_V - \kappa_F$ plane.
- 8 The quoted result is for the stage-0 simplified template cross section (STXS) and the $\sigma_{ggF}\cdot B$ is 2030+598 fb (see their Figs. 10 and 14). Measured cross sections and ratios to the SM predictions in the reduced stage-1.2 STXS (see their Fig. 1) are shown in their Table 9 and Figs. 12 and 14.
- $^9\,{\rm The}$ quoted result is for the stage-0 STXS and the $\sigma_{VBF}\cdot B$ is $267^{+53.9}_{-52.6}$ fb (see their Figs. 10 and 14). Measured cross sections and ratios to the SM predictions in the reduced stage-1.2 STXS (see their Fig. 2) are shown in their Table 9 and Figs. 12, 14.
- 10 The quoted result is for the stage-0 STXS and the $\sigma_{VH}\cdot B$ is 79.0 $^{+20.5}_{-18.6}$ fb (see their Figs. 10 and 14). Measured cross sections and ratios to the SM predictions in the reduced stage-1.2 STXS (see their Fig. 3) are shown in their Table 9 and Figs. 12, 14.
- 11 AAD 22Q measure cross sections of p p $\rightarrow~$ H $\rightarrow~$ $\tau\,\tau$ at $E_{\rm cm}$ = 13 TeV with 139 fb $^{-1}$ data. The quoted results are given for $m_H = 125.09$ GeV and |y(H)| < 2.5 is required. The inclusive fiducial $\sigma \cdot B$ is $2.94 \pm 0.21 \substack{+0.37 \\ -0.32}$ pb. The fiducial $\sigma \cdot B$ for the four dominant production modes are $2.65 \pm 0.41 \substack{+0.91 \\ -0.67}$ pb for ggF, $0.197 \pm 0.028 \substack{+0.032 \\ -0.026}$ pb for VBF, $0.115 \pm 0.058 \stackrel{+0.042}{_{-0.040}}$ pb for V H, $0.033 \pm 0.031 \stackrel{+0.022}{_{-0.017}}$ pb for $t\bar{t}H$. The cross sections using simplified template cross section framework (STXS) are given in their Fig. 14(a) and Table 15. The STXS bins (a reduced stage 1.2) are defined in their Fig. 1.
- 12 TUMASYAN 22AJ measure cross sections with $\it pp \rightarrow ~H \rightarrow ~\tau \tau$ at $\it E_{cm} =$ 13 TeV with 138 fb $^{-1}$ data. The fiducial inclusive $\sigma \cdot B$ is 426 \pm 102 fb while 408 \pm 27 fb is expected in the Standard Mode for $m_{H} = 125.38$ GeV. Three differential cross sections are given; see their Fig. 1.
- 13 SIRUNYAN 19AF use 35.9 fb $^{-1}$ of data. The quoted signal strength is given for $m_H =$ 125 GeV and corresponds to 2.3 standard deviations.
- 14 SIRUNYAN 19AF use 35.9 fb $^{-1}$ of data. HW/Z channels are added with a few updates on gluon fusion and vector boson fusion with respect to SIRUNYAN 18Y. The quoted signal strength is given for $m_{H} = 125$ GeV and corresponds to 5.5 standard deviations. The signal strengths for the individual production modes are: 1.12 + 0.53 - 0.50 for gluon fusion,

 $1.13^{+0.45}_{-0.42}$ for vector boson fusion, $3.39^{+1.68}_{-1.54}$ for WH and $1.23^{+1.62}_{-1.35}$ for ZH. See their Fig. 7 for other couplings (κ_V, κ_f).

NODE=S126STT;LINKAGE=N

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- 15 SIRUNYAN 19AT perform a combine fit to 35.9 fb $^{-1}$ of data at $E_{\rm cm}=$ 13 TeV. This
- combination is based on SIRUNYAN 18Y. ¹⁶SIRUNYAN 18Y use 35.9 fb⁻¹ of *pp* collisions at $E_{\rm cm} = 13$ TeV. The quoted signal strength is given for $m_{\rm H} = 125.09$ GeV and corresponds to 4.9 standard deviations.
- $^{17}\rm SIRUNYAN$ 18Y combine the result of 35.9 fb $^{-1}$ at $E_{\rm cm}$ = 13 TeV with the results obtained from data of 4.9 fb⁻¹ at $E_{\rm cm} = 7$ TeV and 19.7 fb⁻¹ at $E_{\rm cm} = 8$ TeV (KHACHATRYAN 15AM). The quoted signal strength is given for $m_H = 125.09$ GeV and corresponds to 5.9 standard deviations.
- 18 AAD 16AC measure the signal strength with $\it pp \rightarrow ~HW/ZX$ processes using 20.3 fb $^{-1}$ of $E_{\rm cm}=$ 8 TeV. The quoted signal strength is given for $m_{H}=$ 125 GeV.
- ¹⁹ AAD 16K use up to 4.7 fb⁻¹ of *pp* collisions at $E_{\rm cm} =$ 7 TeV and up to 20.3 fb⁻¹ at $E_{\rm cm} =$ 8 TeV. The quoted signal strength is given for $m_H =$ 125.36 GeV.
- ²⁰ AAD 15AH use 4.5 fb⁻¹ of *pp* collisions at $E_{\rm cm} = 7$ TeV and 20.3 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The third uncertainty in the measurement is theory systematics. The signal strength for the gluon fusion mode is 2.0 \pm 0.8 $\substack{+1.2\\-0.8}$ \pm 0.3 and that for vector boson fusion and W/ZH production modes is $1.24 + 0.49 + 0.31 \pm 0.08$. The quoted signal strength is given for $m_H = 125.36$ GeV.
- ²¹CHATRCHYAN 14K use 4.9 fb⁻¹ of pp collisions at $E_{cm} = 7$ TeV and 19.7 fb⁻¹ at $E_{cm} = 8$ TeV. The quoted signal strength is given for $m_H = 125$ GeV. See also CHATRCHYAN 14AJ.
- ²²AALTONEN 13L combine all CDF results with 9.45–10.0 fb⁻¹ of $p\bar{p}$ collisions at $E_{\rm cm}$ = 1.96 TeV. The quoted signal strength is given for $m_{\rm H}$ = 125 GeV.
- ²³ABAZOV 13L combine all D0 results with up to 9.7 fb⁻¹ of $p\bar{p}$ collisions at $E_{\rm cm} =$ 1.96 TeV. The quoted signal strength is given for $m_H =$ 125 GeV.
- ²⁴ AAD 12AI obtain results based on 4.7 fb⁻¹ of pp collisions at $E_{\rm cm} = 7$ TeV. The quoted signal strengths are given in their Fig. 10 for $m_H = 126$ GeV. See also Fig. 13 of AAD 12DA.
- 25 CHATRCHYAN 12N obtain results based on 4.9 fb $^{-1}$ of *pp* collisions at $E_{\rm cm}{=}7$ TeV and 5.1 fb⁻¹ at $E_{\rm cm}$ =8 TeV. The quoted signal strength is given for m_H =125.5 GeV. See also CHATRCHYAN 13Y .

$Z\gamma$ Final State

VALUE	<u>CL%</u>	DOCUMENT ID	TECN	COMMENT	
2.2 ±0.7		¹ AAD	24D LHC	<i>рр</i> , 13 ТеV	
\bullet \bullet \bullet We do not use	the followin	g data for average	s, fits, limits,	etc. • • •	
$2.4\ \pm 0.9$		² TUMASYAN	23F CMS	<i>рр</i> , 13 ТеV	1
$2.59^{+1.07}_{-0.96}$		³ CMS	22 CMS	<i>рр</i> , 13 ТеV	
< 3.6	95	⁴ AAD	20AG ATLS	<i>рр</i> , 13 ТеV	
< 7.4	95	⁵ SIRUNYAN		<i>рр</i> , 13 ТеV	
< 6.6	95	⁶ AABOUD	17AW ATLS	<i>рр</i> , 13 ТеV	
<11	95	⁷ AAD	14J ATLS	<i>рр</i> , 7, 8 ТеV	
< 9.5	95	⁸ CHATRCHYA	N 13BK CMS	<i>рр</i> , 7, 8 ТеV	
					_

¹AAD 24D report combined results of ATLAS (AAD 20AG) and CMS (TUMASYAN 23F). The reported signal strength corresponds to a significance of 3.4 $\sigma.$

²TUMASYAN 23F search for $H \rightarrow Z\gamma$, $Z \rightarrow ee$, $\mu\mu$ in 138 fb⁻¹ of pp collisions at $E_{\rm cm} = 13$ TeV, assuming $m_H = 125.38$ GeV. $\sigma(pp \rightarrow H) \cdot B(H \rightarrow Z\gamma)$ is measured to be 0.21 \pm 0.08 pb. The ratio of branching fractions $B(H \rightarrow Z\gamma)/B(H \rightarrow \gamma\gamma)$ is measured to be $1.5^{+0.7}_{-0.6}$.

³CMS 22 report combined results (see their Extended Data Table 2) using up to 138 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV, assuming $m_{H} = 125.38$ GeV. See their Fig. 2 right.

⁴AAD 20AG search for $H \rightarrow Z\gamma$, $Z \rightarrow ee$, $\mu\mu$ in 139 fb⁻¹ of pp collisions at $E_{cm} =$ 13 TeV. The signal strength is $2.0 \pm 0.9 \stackrel{+0.4}{-0.3}$ at $m_H = 125.09$ GeV, which corresponds to a significance of 2.2 σ . The upper limit of $\sigma(pp \rightarrow H) \cdot B(H \rightarrow Z\gamma)$ is 305 fb at 95% CL.

- ⁵SIRUNYAN 18DQ search for $H
 ightarrow Z \gamma$, $Z
 ightarrow ee, \ \mu\mu$ in 35.9 fb $^{-1}$ of pp collisions at $E_{\rm cm} = 13$ TeV. The quoted signal strength (see their Figs. 6 and 7) is given for $m_H = 125$ GeV.
- ⁶AABOUD 17AW search for $H \rightarrow Z\gamma$, $Z \rightarrow ee$, $\mu\mu$ in 36.1 fb⁻¹ of pp collisions at $E_{\rm cm} = 13$ TeV. The quoted signal strength is given for $m_H = 125.09$ GeV. The upper limit on the branching ratio of $H \rightarrow Z\gamma$ is 1.0% at 95% CL assuming the SM Higgs boson production.
- ⁷AAD 14J search for $H \rightarrow Z\gamma \rightarrow \ell\ell\gamma$ in 4.5 fb⁻¹ of *pp* collisions at $E_{\rm cm}$ = 7 TeV and 20.3 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The quoted signal strength is given for $m_H = 125.5$ GeV.
- 8 CHATRCHYAN 13BK search for $H o~Z\gamma o~\ell\ell\gamma$ in 5.0 fb $^{-1}$ of pp collisions at $E_{
 m cm}$ = 7 TeV and 19.6 fb⁻¹ at $E_{\rm cm}$ = 8 TeV. A limit on cross section times branching ratio which corresponds to (4-25) times the expected Standard Model cross section is given in the range $m_H = 120-160$ GeV at 95% CL. The quoted limit is given for $m_H = 125$ GeV, where 10 is expected for no signal.

- NODE=S126STT;LINKAGE=L
- NODE=S126STT:LINKAGE=D

NODE=S126STT:LINKAGE=E

NODE=S126STT:LINKAGE=F

NODE=S126STT:LINKAGE=C

NODE=S126STT;LINKAGE=B

NODE=S126STT;LINKAGE=A

NODE=S126STT:LINKAGE=LL

NODE=S126STT:LINKAGE=AB

NODE=S126STT;LINKAGE=AA

NODE=S126STT;LINKAGE=CA

NODE=S126SZG NODE=S126SZG

NODE=S126SZG;LINKAGE=G NODE=S126SZG;LINKAGE=F

NODE=S126SZG;LINKAGE=E

NODE=S126SZG;LINKAGE=D

NODE=S126SZG;LINKAGE=C

NODE=S126SZG;LINKAGE=B

NODE=S126SZG:LINKAGE=A

NODE=S126SZG;LINKAGE=TH

γ[*]γ Final State <i>VALUE</i>	CL% DOCUMENT ID TECN COMMENT	NODE=S126A01 NODE=S126A01
$1.5 \pm 0.5 \substack{+0.2 \\ -0.1}$	¹ AAD 211 ATLS <i>pp</i> , 13 TeV, $H \rightarrow \ell \ell \gamma$, 139 fb ⁻¹	
• • • We do not use the	following data for averages, fits, limits, etc. \bullet \bullet	
<4.0	95 ² SIRUNYAN 18DQ CMS $pp \rightarrow HX$, 13 TeV, $H \rightarrow \gamma^* \gamma$	
<6.7	95 ³ KHACHATRY16B CMS <i>pp</i> , 8 TeV, $ee\gamma$, $\mu\mu\gamma$	
through $\gamma^*.$ The qued deviations and is give	→ $\ell\ell\gamma$ ($\ell = e, \mu$) in 139 fb ⁻¹ of pp collisions at $E_{\rm cm} = 13$ TeV. $m_{\ell\ell}$ is smaller than 30 GeV. This region is dominated by the decay oted signal strength corresponds to a significance of 3.2 standard en for $m_H = 125.09$ GeV. The cross section times the branching r $m_{\ell\ell} < 30$ GeV is measured to be $8.7 \pm 2.7 \substack{+0.7 \\ -0.6}$ fb.	NODE=S126A01;LINKAGE=C
	rch for $H \rightarrow \gamma^* \gamma$, $\gamma^* \rightarrow \mu \mu$ in 35.9 fb ⁻¹ of <i>pp</i> collisions at $E_{\rm cm}$	NODE=S126A01;LINKAGE=A
= 13 TeV. The mass	of γ^* is smaller than 50 GeV except in J/ψ and $arphi$ mass regions.	
3 KHACHATRYAN 16B < 3.5 GeV and m(μ^+	ength (see their Figs. 6 and 7) is given for $m_H = 125$ GeV. a search for $H \rightarrow \gamma^* \gamma \rightarrow e^+ e^- \gamma$ and $\mu^+ \mu^- \gamma$ (with m($e^+ e^-$) $(\mu^-)^- \gamma^- \gamma^- \gamma^- \gamma^- \gamma^- \gamma^- \gamma^- \gamma^- \gamma^- \gamma$	NODE=S126A01;LINKAGE=B
	Higgs couplings	NODE=S126250
Fermion coupling (κ_F	•)	NODE=S126KFC
<u>VALUE</u> 0.94 ±0.05 OUR AVERA [0.95 ± 0.05 OUR 2023 A		NODE=S126KFC NEW
0.86 +0.14	¹ TUMASYAN 23W CMS pp , 13 TeV, $H \rightarrow WW^*$	
0.00 - 0.11 0.95 ±0.05	² ATLAS 22 ATLS pp , 13 TeV	
	following data for averages, fits, limits, etc. $\bullet \bullet \bullet$	
$1.00 \ +0.16 \ -0.13$	³ AAD 23Y ATLS <i>pp</i> , 13 TeV, $H \rightarrow \gamma \gamma$	
0.906	⁴ СМЅ 22 СМЅ <i>pp</i> , 13 TeV	
with 138 fb ⁻¹ data, 95% CL contours in t 2 ATLAS 22 report con fb ⁻¹ of data at E_{cm}	nbined results (see their Extended Data Table 1) using up to 139 = 13 TeV, assuming $m_{H} = 125.09$ GeV, $\kappa_{V} > 0$, and $\kappa_{E} > 0$	NODE=S126KFC;LINKAGE=C NODE=S126KFC;LINKAGE=A
0 ($B_{inv} = B_{undetec}$ ³ AAD 23Y measure Hi	$t_{ted} = 0$). See their Fig. 4. ggs production rates with $H \rightarrow \gamma \gamma$ at $E_{cm} = 13$ TeV with 139 $m_H = 125.09$ GeV. See their Fig. 23 for the 68% and 95% CL	NODE=S126KFC;LINKAGE=D
contours in the κ_V –	κ_F plane, where $\kappa_F > 0$ is assumed.	
of data at $E_{\rm cm}=13$	ned results (see their Extended Data Table 2) using up to 138 fb $^{-1}$ TeV, assuming $m_H=$ 125.38 GeV. No uncertainty is given while s 68% and 95% CL contours.	NODE=S126KFC;LINKAGE=B
$\begin{array}{c} \textbf{Gauge boson coupling} \\ \hline \textbf{VALUE} \\ \textbf{1.023 \pm 0.026 OUR AVER} \\ [1.035 \pm 0.031 \ \text{OUR 2023} \end{array}$	AGE	NODE=S126KVC NODE=S126KVC NEW
$0.99 \ \pm 0.05$	$rac{1}{2}$ TUMASYAN 23W CMS pp, 13 TeV, $H o W W^*$	
1.035 ± 0.031 • • • We do not use the	² ATLAS 22 ATLS pp , 13 TeV following data for averages, fits, limits, etc. • • •	
0.06		
$1.02 + 0.00 \\ - 0.05 \\ 1.014$	³ AAD 23Y ATLS <i>pp</i> , 13 TeV, $H \rightarrow \gamma \gamma$ ⁴ CMS 22 CMS <i>pp</i> , 13 TeV	
	asure Higgs production rates with $H \rightarrow WW^*$ at $E_{cm} = 13$ TeV	
	assuming $m_H = 125.38$ GeV. See their Fig. 25 for the 68% and	NODE=S126KVC;LINKAGE=C
² ATLAS 22 report con fb ⁻¹ of data at E_{cm} 0 ($B_{inv} = B_{undetec}$	nbined results (see their Extended Data Table 1) using up to 139 = 13 TeV, assuming $m_H = 125.09$ GeV, $\kappa_V \ge 0$, and $\kappa_F \ge ted = 0$). See their Fig. 4.	NODE=S126KVC;LINKAGE=A
³ AAD 23Y measure Hi fb ⁻¹ data, assuming	iggs production rates with $H \rightarrow \gamma \gamma$ at $E_{\rm cm} = 13$ TeV with 139 $m_H = 125.09$ GeV. See their Fig. 23 for the 68% and 95% CL	NODE=S126KVC;LINKAGE=D
	κ_F plane, where $\kappa_F > 0$ is assumed. ned results (see their Extended Data Table 2) using up to 138 fb ⁻¹	NODE=S126KVC:LINKAGE=B

 4 CMS 22 report combined results (see their Extended Data Table 2) using up to 138 fb $^{-1}$ of data at $E_{\rm cm}=$ 13 TeV, assuming $m_{H}=$ 125.38 GeV. See their Fig. 3 left.

NODE=S126KVC;LINKAGE=B

NODE=S126KWC;LINKAGE=A

NODE=S126KWC;LINKAGE=F

NODE=S126KWC;LINKAGE=B

NODE=S126KWC;LINKAGE=E

NODE=S126KWC;LINKAGE=C

NODE=S126KWC;LINKAGE=G

NODE=S126KWC;LINKAGE=D

NODE=S126KZC;LINKAGE=F

NODE=S126KZC;LINKAGE=B

NODE=S126KZC;LINKAGE=E

NODE=S126KZC;LINKAGE=C

NODE=S126KZC;LINKAGE=G

NODE=S126KZC;LINKAGE=D

NODE=S126KWC NODE=S126KWC

OCCUR=2

OCCUR=3

OCCUR=2

W boson coupling	(κ_W)				
VALUE	DOCUMENT	D	TECN	COMMENT	
• • • We do not use t	he following data for avera	ges, fits	, limits, e	etc. • • •	
1.02 ± 0.05	^{1,2} ATLAS	22	ATLS	<i>рр</i> , 13 ТеV	
$1.05 \!\pm\! 0.06$	^{1,3} ATLAS	22	ATLS	<i>рр</i> , 13 ТеV	
$1.00 \substack{+ 0.00 \\ - 0.02}$	^{1,4} ATLAS	22	ATLS	<i>рр</i> , 13 ТеV	

22

CMS

22 CMS

pp, 13 TeV

pp, 13 TeV

 1 ATLAS 22 report combined results (see their Extended Data Table 1) using up to 139 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV, assuming $m_{H} = 125.09$ GeV.

^{5,6} CMS

5,7 CMS

² All modifiers(κ) > 0, and $\kappa_c = \kappa_t$ ($B_{inv} = B_{undetected} = 0$) are assumed. Only SM particles assume to contribute to the loop-induced processes. See their Fig. 5, which shows both $\kappa_c = \kappa_t \; \mathrm{and} \kappa_c$ floating.

 ${}^{3}B_{inv} = B_{undetected} = 0$ is assumed. Coupling strength modifiers including effective photon, $Z\gamma$ and gluon are measured. See their Fig. 6.

 ${}^{4}B_{inv}$ floating, $B_{undetected} \geq 0$, and $\kappa_V \leq 1$ are assumed. Coupling strength modifiers including effective photon, $Z\gamma$ and gluon are measured. See their Fig. 6.

 5 CMS 22 report combined results (see their Extended Data Table 2) using up to 138 fb $^{-1}$ of data at $E_{\rm cm}=13$ TeV, assuming $m_{H}=125.38$ GeV.

 6 Only SM particles assume to contribute to the loop-induced processes. See their Fig. 3 right.

 7 Coupling strength modifiers including effective photon, $Z\gamma$ and gluon are measured. See their Fig. 4 left.

Z boson coupling (κ_Z)

 1.06 ± 0.07

 1.02 ± 0.08

Z boson coupling (κ_Z)	DOCUMENT	ID	TECN	COMMENT	NODE=S126KZC NODE=S126KZC
\bullet \bullet We do not use the following	wing data for avera	ages, fits	, limits,	etc. • • •	
$0.99 \substack{+0.06 \\ -0.05}$	^{1,2} ATLAS	22	ATLS	<i>pp</i> , 13 TeV	
0.99±0.06	1,3 ATLAS	22	ATLS	<i>рр</i> , 13 ТеV	OCCUR=2
$0.98 \substack{+0.02 \\ -0.05}$	1,4 ATLAS	22	ATLS	<i>рр</i> , 13 ТеV	OCCUR=3
1.04 ± 0.07	^{5,6} CMS	22	CMS	<i>рр</i> , 13 ТеV	
1.04 ± 0.07	^{5,7} CMS	22	CMS	<i>pp</i> , 13 TeV	OCCUR=2
¹ ATLAS 22 report combine	ed results (see their	r Extend	ed Data	Table 1) using up to 139	NODE=S126KZC;LINKAGE=A

fb⁻¹ of data at $E_{\rm cm} = 13$ TeV, assuming $m_H = 125.09$ GeV.

² All modifiers(κ) > 0, and $\kappa_c = \kappa_t$ ($B_{inv} = B_{undetected} = 0$) are assumed. Only SM particles assume to contribute to the loop-induced processes.See their Fig. 5, which shows both $\kappa_c = \kappa_t$ and κ_c floating.

 ${}^{3}B_{inv} = B_{undetected} = 0$ is assumed. Coupling strength modifiers including effective photon, $Z\gamma$ and gluon are measured. See their Fig. 6.

 ${}^4B_{inv}$ floating, $B_{undetected} \ge 0$, and $\kappa_V \le 1$ are assumed. Coupling strength modifiers including effective photon, $Z\gamma$ and gluon are measured. See their Fig. 6.

 5 CMS 22 report combined results (see their Extended Data Table 2) using up to 138 fb $^{-1}$ of data at $E_{\rm cm} = 13$ TeV, assuming $m_H = 125.38$ GeV.

 6 Only SM particles assume to contribute to the loop-induced processes. See their Fig. 3 right.

⁷Coupling strength modifiers including effective photon, $Z\gamma$ and gluon are measured. See their Fig. 4 left.

top Yukawa coupling (κ_t)

<u>CL%</u>	DOCUMENT ID	TECN	COMMENT		NODE=S12
llowin	ng data for averages, f	its, limits, etc.	• • •		
95	¹ AAD	23BC ATLS	<i>рр</i> , 13 ТеV		
95		23Y ATLS	<i>рр</i> , 13 ТеV		
95		23Y ATLS	<i>рр</i> , 13 ТеV		OCCUR=2
95	⁴ TUMASYAN	23P CMS	<i>рр</i> , 13 ТеV		
		23P CMS	<i>рр</i> , 13 ТеV		OCCUR=2
	^{6,7} ATLAS	22 ATLS	<i>рр</i> , 13 ТеV		
	^{6,8} ATLAS	22 ATLS	<i>рр</i> , 13 ТеV		OCCUR=2
	^{6,9} ATLAS	22 ATLS	<i>рр</i> , 13 ТеV		OCCUR=3
	$^{10,11}\mathrm{CMS}$	22 CMS	<i>рр</i> , 13 ТеV		
	$^{10,12}\mathrm{CMS}$	22 CMS	<i>рр</i> , 13 ТеV		OCCUR=2
95	¹³ SIRUNYAN	21R CMS	<i>рр</i> , 13 ТеV		
95	¹⁴ SIRUNYAN	20C CMS	<i>pp</i> , 13 TeV		
95	¹⁵ SIRUNYAN	19BY CMS	<i>pp</i> , 13 TeV		
95	¹⁶ SIRUNYAN	18BU CMS	<i>pp</i> , 13 TeV		
	95 95 95 95 95 95 95 95 95	Join Join 95 1 AAD 95 2 AAD 95 3 AAD 95 4 TUMASYAN 4,5 TUMASYAN 6,7 ATLAS 6,8 ATLAS 10,11 CMS 95 13 95 14 95 15 95 15	Join Join <thjoin< th=""> Join Join <thj< td=""><td>95 1 AAD 23BC ATLS pp, 13 TeV 95 2 AAD 23Y ATLS pp, 13 TeV 95 2 AAD 23Y ATLS pp, 13 TeV 95 3 AAD 23Y ATLS pp, 13 TeV 95 3 AAD 23Y ATLS pp, 13 TeV 95 4 TUMASYAN 23P CMS pp, 13 TeV 6,7 ATLAS 22 ATLS pp, 13 TeV 6,8 ATLAS 22 ATLS pp, 13 TeV 10,11 CMS 22 CMS pp, 13 TeV 10,12 CMS 22 CMS pp, 13 TeV 95 14 SIRUNYAN <td< td=""><td>95 1 AAD 23BC ATLS pp, 13 TeV 95 2 AAD 23Y ATLS pp, 13 TeV 95 3 AAD 23Y ATLS pp, 13 TeV 95 4 AD 23Y ATLS pp, 13 TeV 95 4 AD 23Y ATLS pp, 13 TeV 95 4 AD 23P CMS pp, 13 TeV 95 4 TUMASYAN 23P CMS pp, 13 TeV 95 4 TUMASYAN 23P CMS pp, 13 TeV 4,5 TUMASYAN 23P CMS pp, 13 TeV 6,7 ATLAS 22 ATLS pp, 13 TeV 6,8 ATLAS 22 ATLS pp, 13 TeV 6,9 ATLAS 22 CMS pp, 13 TeV 10,11 CMS 22 CMS pp, 13 TeV 10,12 CMS 22 CMS pp, 13 TeV 95 14 SIRUNYAN 21R CMS pp, 13 TeV 95 14 SIRUNYAN 20C CMS pp, 13 TeV 95 15 SIRUNYAN 19BY CMS pp, 13 TeV</td></td<></td></thj<></thjoin<>	95 1 AAD 23BC ATLS pp , 13 TeV 95 2 AAD 23Y ATLS pp , 13 TeV 95 2 AAD 23Y ATLS pp , 13 TeV 95 3 AAD 23Y ATLS pp , 13 TeV 95 3 AAD 23Y ATLS pp , 13 TeV 95 4 TUMASYAN 23P CMS pp , 13 TeV 95 4 TUMASYAN 23P CMS pp , 13 TeV 95 4 TUMASYAN 23P CMS pp , 13 TeV 95 4 TUMASYAN 23P CMS pp , 13 TeV 6,7 ATLAS 22 ATLS pp , 13 TeV 6,8 ATLAS 22 ATLS pp , 13 TeV 10,11 CMS 22 CMS pp , 13 TeV 10,12 CMS 22 CMS pp , 13 TeV 95 14 SIRUNYAN <td< td=""><td>95 1 AAD 23BC ATLS pp, 13 TeV 95 2 AAD 23Y ATLS pp, 13 TeV 95 3 AAD 23Y ATLS pp, 13 TeV 95 4 AD 23Y ATLS pp, 13 TeV 95 4 AD 23Y ATLS pp, 13 TeV 95 4 AD 23P CMS pp, 13 TeV 95 4 TUMASYAN 23P CMS pp, 13 TeV 95 4 TUMASYAN 23P CMS pp, 13 TeV 4,5 TUMASYAN 23P CMS pp, 13 TeV 6,7 ATLAS 22 ATLS pp, 13 TeV 6,8 ATLAS 22 ATLS pp, 13 TeV 6,9 ATLAS 22 CMS pp, 13 TeV 10,11 CMS 22 CMS pp, 13 TeV 10,12 CMS 22 CMS pp, 13 TeV 95 14 SIRUNYAN 21R CMS pp, 13 TeV 95 14 SIRUNYAN 20C CMS pp, 13 TeV 95 15 SIRUNYAN 19BY CMS pp, 13 TeV</td></td<>	95 1 AAD 23BC ATLS pp , 13 TeV 95 2 AAD 23Y ATLS pp , 13 TeV 95 3 AAD 23Y ATLS pp , 13 TeV 95 4 AD 23Y ATLS pp , 13 TeV 95 4 AD 23Y ATLS pp , 13 TeV 95 4 AD 23P CMS pp , 13 TeV 95 4 TUMASYAN 23P CMS pp , 13 TeV 95 4 TUMASYAN 23P CMS pp , 13 TeV 4,5 TUMASYAN 23P CMS pp , 13 TeV 6,7 ATLAS 22 ATLS pp , 13 TeV 6,8 ATLAS 22 ATLS pp , 13 TeV 6,9 ATLAS 22 CMS pp , 13 TeV 10,11 CMS 22 CMS pp , 13 TeV 10,12 CMS 22 CMS pp , 13 TeV 95 14 SIRUNYAN 21R CMS pp , 13 TeV 95 14 SIRUNYAN 20C CMS pp , 13 TeV 95 15 SIRUNYAN 19BY CMS pp , 13 TeV

NODE=S126YTC SI26YTC

		3/18/2024 16:34 Page 32
final states with 140 fb ⁻ the ratio of the top qua	production of four top quarks with same-sign and multilepton p_p collision data at $E_{cm} = 13$ TeV. The results constraint rk Yukawa coupling y_t to its Standard Model value, yielding	NODE=S126YTC;LINKAGE=Q
² AAD 23Y constrain κ_t fr collision data at $E_{cm} =$	6 CL. See their Fig. 8 as a function of κ_t and <i>CP</i> -mixing angle. rom Higgs production rates with $H \rightarrow \gamma \gamma$ with 139 fb ⁻¹ pp 13 TeV. The quoted result is obtained assuming the SM loop and $H \rightarrow \gamma \gamma$. See their Fig. 14.	NODE=S126YTC;LINKAGE=O
³ AAD 23Y constrain κ_t f pp collision data at E_{cm}	from Higgs production rates with $H \rightarrow \gamma \gamma$ with 139 fb ⁻¹ $\eta = 13$ TeV. The quoted result is obtained assuming effective γ for $gg \rightarrow H$ and $H \rightarrow \gamma \gamma$, respectively. See their Fig. 14.	NODE=S126YTC;LINKAGE=P
(multilepton decay mode	ain κ_t from $t \bar{t} H$ and $t H$ decaying $H \to W W^*$ and $H \to \tau \tau$ b) with 138 fb ⁻¹ pp collision data at $E_{\rm cm} = 13$ TeV. The $\kappa_t = 0$ and other couplings (κ_V etc.) to the SM values. See their s and Table 6.	NODE=S126YTC;LINKAGE=M
⁵ The quoted result is obta	ined by combining with other $t \bar{t} H$ decaying $H \rightarrow \gamma \gamma$ (SIRUN- ℓ (SIRUNYAN 21AE) and $\tilde{\kappa}_t = 0$. See their Fig. 12 for 2-dim	NODE=S126YTC;LINKAGE=N
⁶ ATLAS 22 report combir fb ⁻¹ of data at E _{cm} =	ned results (see their Extended Data Table 1) using up to 139 13 TeV, assuming $m_{H}=125.09$ GeV.	NODE=S126YTC;LINKAGE=E
⁷ All modifiers(κ) > 0, and particles assume to cont shows both $\kappa_c = \kappa_t$ and	d $\kappa_c = \kappa_t (B_{inv} = B_{undetected} = 0)$ are assumed. Only SM cribute to the loop-induced processes.See their Fig. 5, which κ_c floating.	NODE=S126YTC;LINKAGE=J
${}^{8}B_{inv} = B_{undetected} =$ photon, $Z\gamma$ and gluon ar	• 0 is assumed. Coupling strength modifiers including effective re measured. See their Fig. 6.	NODE=S126YTC;LINKAGE=F
⁹ B _{inv} floating, B _{undetee} modifiers including effect	$_{cted} \geq$ 0, and $\kappa_V \leq$ 1 are assumed. Coupling strength ive photon, Z γ and gluon are measured. See their Fig. 6.	NODE=S126YTC;LINKAGE=I
¹⁰ CMS 22 report combined	results (see their Extended Data Table 2) using up to 138 fb ⁻¹ V, assuming $m_H = 125.38$ GeV.	NODE=S126YTC;LINKAGE=G
	e to contribute to the loop-induced processes. See their Fig. 3	NODE=S126YTC;LINKAGE=K
	ers including effective photon, $Z\gamma$ and gluon are measured. See	NODE=S126YTC;LINKAGE=H
¹³ SIRUNYAN 21R constrair	n the ratio of the top quark Yukawa coupling y_t to its Standard	NODE=S126YTC;LINKAGE=D
	and tH production rates using 137 fb ⁻¹ pp collision data at ing a SM Higgs couplings to τ 's, the joint interval $-0.9 <$ and $0.7 < \kappa_t < 1.1$ is obtained at 95% CL (see their Fig. 17).	
tilepton final states with constraint the ratio of the	for the production of four top quarks with same-sign and mul- 137 fb ⁻¹ pp collision data at $E_{\rm cm} = 13$ TeV. The results e top quark Yukawa coupling y_t to its Standard Model value by value of a theoretical prediction (see their Refs. [1-2]), yielding 6 CL. See their Fig. 5.	NODE=S126YTC;LINKAGE=A
¹⁵ SIRUNYAN 19BY measure tions, the invariant mass \bar{t} , in the ℓ +jets final stars results constraint the rational stars	re the top quark Yukawa coupling from $t\bar{t}$ kinematic distribu- of the top quark pair and the rapidity difference between t and the with 35.8 fb ⁻¹ pp collision data at $E_{\rm cm} = 13$ TeV. The io of the top quark Yukawa coupling to its the Standard Model in upper limit of 1.67 at 95% CL (see their Table III).	NODE=S126YTC;LINKAGE=B
¹⁶ SIRUNYAN 18BU search tilepton final states with constraint the ratio of th	for the production of four top quarks with same-sign and mul- 35.9 fb ⁻¹ pp collision data at $E_{\rm cm} = 13$ TeV. The results to top quark Yukawa coupling y_t to its the Standard Model by value of a theoretical prediction (see their Ref. [16]), yielding	NODE=S126YTC;LINKAGE=C
bottom Yukawa coupling VALUE CL%	ς (κ _b) DOCUMENT ID TECN COMMENT	NODE=S126KBC NODE=S126KBC
	lowing data for averages, fits, limits, etc. $\bullet \bullet \bullet$	
-1.09 to -0.86 OR 95 0.81 to 1.09	¹ AAD 23C ATLS <i>pp</i> , 13 TeV, $\gamma \gamma$, $ZZ^* \rightarrow 4\ell$ cross sections	
-1.1 to 1.1 95	² AAD 23CD ATLS pp , 13 TeV, $H \rightarrow \Upsilon(nS)\gamma$ ³ HAYRAPETY23 CMS pp , 13 TeV, $ZZ^* \rightarrow 4\ell$	

-1.1 to 1.1³ HAYRAPETY...23 CMS *pp*, 13 TeV, *ZZ*^{*} cross sections ⁵ ATLAS 22 ATLS *pp*, 13 TeV $\rightarrow 4\ell$ 95 ^{4,5} ATLAS ^{4,6} ATLAS 0.90 ± 0.11 $0.89 \!\pm\! 0.11$ 22 ATLS pp, 13 TeV OCCUR=2 $0.82\substack{+\,0.09\\-\,0.08}$ OCCUR=3 ^{4,7} ATLAS 22 ATLS pp, 13 TeV $1.02^{+0.15}_{-0.17}$ ^{8,9} CMS 22 CMS *pp*, 13 TeV $0.99\substack{+0.17\\-0.16}$ ^{8,10} CMS 22 CMS pp, 13 TeV

OCCUR=2

¹AAD 23C combine results of $H \rightarrow \gamma \gamma$ and $H \rightarrow ZZ^* \rightarrow 4\ell$ ($\ell = e, \mu$) using 139 fb⁻¹ NODE=S126KBC;LINKAGE=I at $E_{\rm Cm} = 13$ TeV. The Higgs boson transverse momentum (p_T^H) distribution constrains κ_b and κ_c , assuming other couplings fixed to the SM values. The κ_b is obtained using the p_T^H shape and normalisation. Other cases are given in their Tables 6 and 7. ² AAD ²3CD search for $H \rightarrow \Upsilon(nS)\gamma$, $\Upsilon(nS) \rightarrow \mu^{+}\mu^{-}$ (n=1,2,3) with 138 fb⁻¹ of pp collision data at $E_{cm} = 13$ TeV. They interpret the $H \rightarrow \Upsilon(nS)\gamma$ search to constraint NODE=S126KBC:LINKAGE=J the bottom Yukawa coupling by comparing to $H \rightarrow \gamma \gamma$. An observed 95% CL interval of (-37, 40) is obtained for κ_b/κ_γ . ³HAYRAPETYAN 23 measure the cross sections for $pp \rightarrow H \rightarrow ZZ^* \rightarrow 4\ell$ ($\ell = e$, NODE=S126KBC;LINKAGE=H $\mu)$ using 138 fb $^{-1}$ at $E_{\rm Cm}=$ 13 TeV. The κ_b is obtained from the p_T differential cross section of the ggF production employing the dependence of the branching fraction on κ_b and κ_c . 4 ATLAS 22 report combined results (see their Extended Data Table 1) using up to NODE=S126KBC;LINKAGE=A 139fb^{-1} of data at $E_{\text{cm}} = 13$ TeV, assuming $m_H = 125.09$ GeV. ⁵ All modifiers (κ) > 0, and $\kappa_c = \kappa_t$ ($B_{inv} = B_{undetected} = 0$) are assumed. Only SM particles assume to contribute to the loop-induced processes. See their Fig. 5, which NODE=S126KBC;LINKAGE=G shows both $\kappa_c = \kappa_t$ and κ_c floating. ${}^{6}B_{inv} = B_{undetected} = 0$ is assumed. Coupling strength modifiers including effective photon, $Z\gamma$ and gluon are measured. See their Fig. 6. NODE=S126KBC;LINKAGE=B $^7B_{inv}$ floating, $B_{undetected} \geq 0$, and $\kappa_V \leq 1$ are assumed. Coupling strength modifiers including effective photon, $Z\gamma$ and gluon are measured. See their Fig. 6. NODE=S126KBC;LINKAGE=E 8 CMS 22 report combined results (see their Extended Data Table 2) using up to 138 fb $^{-1}$ NODE=S126KBC·LINKAGE=C of data at $E_{\rm cm} = 13$ TeV, assuming $m_H = 125.38$ GeV. $^9\,{
m Only}$ SM particles assume to contribute to the loop-induced processes. See their Fig. 3 NODE=S126KBC;LINKAGE=F right. 10 Coupling strength modifiers including effective photon, $Z\gamma$ and gluon are measured. See NODE=S126KBC;LINKAGE=D their Fig. 4 left. charm Yukawa coupling (κ_c) NODE=S126KCC TECN COMMENT NODE=S126KCC DOCUMENT ID VALUE CL% \bullet \bullet \bullet We do not use the following data for averages, fits, limits, etc. \bullet \bullet ¹ AAD $|\kappa_c| < 2.27$ 95 23C ATLS *pp*, 13 TeV, $\gamma\gamma$, $ZZ^* \rightarrow$ 4ℓ cross sections pp, 13 TeV, $H \rightarrow ~J/\psi \gamma$ 2 AAD 23CD ATLS -5.3 to 5.2 ³ HAYRAPETY...23 CMS *pp*, 13 TeV, $ZZ^* \rightarrow 4\ell$ 95 cross sections $1.1 < \left|\kappa_{\mathcal{C}}\right| < 5.5$ ⁴ TUMASYAN 23AH CMS $pp \rightarrow WH/ZH$, 13 TeV 95 $0.03^{+3.02}_{-0.03}$ ⁵ ATLAS 22 ATLS pp, 13 TeV ¹AAD 23C combine results of $H \rightarrow \gamma \gamma$ and $H \rightarrow ZZ^* \rightarrow 4\ell$ ($\ell = e, \mu$) using 139 fb⁻¹ NODE=S126KCC;LINKAGE=D at $E_{\rm cm} = 13$ TeV. The Higgs boson transverse momentum (p_T^H) distribution constrains κ_b and κ_c assuming other couplings fixed to the SM values. The κ_c is obtained using the p_T^H shape and normalisation. Other cases are given in their Tables 6 and 7. See their Table 8 for results combined with VH, $H \rightarrow b\overline{b}$ and $c\overline{c}$. ² AAD 23CD search for $H \rightarrow J/\psi\gamma$, $J/\psi \rightarrow \mu^+\mu^-$ with 138 fb⁻¹ of pp collision data at $E_{\rm cm} = 13$ TeV. They interpret the $H \rightarrow J/\psi\gamma$ search to constraint the charm Yukawa NODE=S126KCC;LINKAGE=E coupling by comparing to $H \rightarrow \gamma \gamma$. An observed 95% CL interval of (-133, 175) is obtained for κ_c/κ_γ . ³HAYRAPETYAN 23 measure the cross sections for $pp \rightarrow H \rightarrow ZZ^* \rightarrow 4\ell$ ($\ell = e$, NODE=S126KCC;LINKAGE=C $\mu)$ using 138 fb $^{-1}$ at $E_{\rm cm}=$ 13 TeV. The κ_c is obtained from the p_T differential cross section of the ggF production employing the dependence of the branching fraction of κ_b and κ_c . ⁴TUMASYAN 23AH search for V H, $H \rightarrow c \overline{c}$ (V = W, Z) using 138 fb⁻¹ of pp NODE=S126KCC;LINKAGE=B collision data at $E_{\rm cm}$ = 13 TeV. The quoted values are obtained from the measured signal strength in the κ -framework, where only the Higgs decay width for $H \rightarrow c \overline{c}$ is changed while assuming all the other decay widths and the production cross section to be SM ones. The quoted values are given for $m_H = 125.38$ GeV. 5 ATLAS 22 report combined results (see their Extended Data Table 1) using up to 139 NODE=S126KCC;LINKAGE=A fb⁻¹ of data at $E_{\rm cm} = 13$ TeV, assuming $m_{H} = 125.09$ GeV, and all modifiers (κ) > 0 ($B_{inv} = B_{undetected} = 0$). Only SM particles assume to contribute to the loop-induced processes. See their Fig. 5, which shows both $\kappa_c = \kappa_t$ and κ_c floating. tau Yukawa coupling (κ_{τ}) NODE=S126KTA NODE=S126KTA VALUE DOCUMENT ID ____<u>TECN___COMMENT</u> • • • We do not use the following data for averages, fits, limits, etc. • • • ^{1,2} ATLAS 22 ATLS pp, 13 TeV 0.94 ± 0.07 ^{1,3} ATLAS $0.93 \!\pm\! 0.07$ 22 ATLS pp, 13 TeV OCCUR=2 $0.91\substack{+\,0.07\\-\,0.06}$ OCCUR=3 ^{1,4} ATLAS ATLS pp, 13 TeV 22 ^{5,6} CMS

22

22

^{5,7} CMS

 0.93 ± 0.08

 $0.92 \!\pm\! 0.08$

CMS

CMS

pp, 13 TeV

pp, 13 TeV

OCCUR=2

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- ¹ ATLAS 22 report combined results (see their Extended Data Table 1) using up to 139 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV, assuming $m_{\rm H} = 125.09$ GeV.
- ² All modifiers(κ) > 0, and $\kappa_c = \kappa_t (B_{inv} = B_{undetected} = 0)$ are assumed. Only SM particles assume to contribute to the loop-induced processes.See their Fig. 5, which shows both $\kappa_c = \kappa_t$ and κ_c floating.
- ${}^{3}B_{inv} = B_{undetected} = 0$ is assumed. Coupling strength modifiers including effective photon, $Z\gamma$ and gluon are measured. See their Fig. 6.
- ${}^4B_{inv}$ floating, $B_{undetected} \geq 0$, and $\kappa_V \leq 1$ are assumed. Coupling strength modifiers including effective photon, $Z\gamma$ and gluon are measured. See their Fig. 6.
- ⁵ CMS 22 report combined results (see their Extended Data Table 2) using up to 138 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV, assuming $m_H = 125.38$ GeV.
- 6 Only SM particles assume to contribute to the loop-induced processes. See their Fig. 3 right.
- 7 Coupling strength modifiers including effective photon, $Z\,\gamma$ and gluon are measured. See their Fig. 4 left.

muon Yukawa couping (κ_{μ})

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following	ng data for averages	, fits,	limits, e	tc. ● ● ●
$1.07^{+0.25}_{-0.31}$	^{1,2} ATLAS	22	ATLS	<i>pp</i> , 13 TeV
$1.06\substack{+0.25\\-0.30}$	1,3 ATLAS	22	ATLS	<i>pp</i> , 13 TeV
$1.04 \substack{+0.23 \\ -0.30}$	^{1,4} ATLAS	22	ATLS	<i>pp</i> , 13 TeV
1.12 ± 0.20	^{5,6} CMS	22	CMS	<i>рр</i> , 13 ТеV
$1.12^{+0.21}_{-0.22}$	^{5,7} cms	22	CMS	<i>pp</i> , 13 TeV

¹ ATLAS 22 report combined results (see their Extended Data Table 1) using up to 139 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV, assuming $m_{H} = 125.09$ GeV.

- ² All modifiers(κ) > 0, and $\kappa_c = \kappa_t (B_{inv} = B_{undetected} = 0)$ are assumed. Only SM particles assume to contribute to the loop-induced processes. See their Fig. 5, which shows both $\kappa_c = \kappa_t$ and κ_c floating.
- ${}^{3}B_{inv} = B_{undetected} = 0$ is assumed. Coupling strength modifiers including effective photon, $Z\gamma$ and gluon are measured. See their Fig. 6.
- ${}^{4}B_{inv}$ floating, $B_{undetected} \geq 0$, and $\kappa_V \leq 1$ are assumed. Coupling strength modifiers including effective photon, $Z\gamma$ and gluon are measured. See their Fig. 6.
- ⁵ CMS 22 report combined results (see their Extended Data Table 2) using up to 138 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV, assuming $m_H = 125.38$ GeV.
- ⁶Only SM particles assume to contribute to the loop-induced processes. See their Fig. 3 right.
- $^7\,{\rm Coupling}$ strength modifiers including effective photon, $Z\,\gamma$ and gluon are measured. See their Fig. 4 left.

photon effective coupling (κ_{γ})

VALUE	DOCUMENT ID		TECN	COMMENT	 NÖ
\bullet \bullet \bullet We do not use the followi	ng data for average	s, fits,	limits, o	etc. • • •	
$1.02^{+0.08}_{-0.07}$	¹ AAD	23Y	ATLS	<i>рр</i> , 13 ТеV	
1.01 ± 0.06	^{2,3} ATLAS	22	ATLS	<i>рр</i> , 13 ТеV	
0.98 ± 0.05	^{2,4} ATLAS	22	ATLS	<i>рр</i> , 13 ТеV	OC
1.10 ± 0.08	⁵ CMS	22	CMS	<i>рр</i> , 13 ТеV	

¹ AAD 23Y constrain κ_{γ} from Higgs production rates with $H \rightarrow \gamma \gamma$ with 139 fb⁻¹ pp collision data at $E_{\rm cm} = 13$ TeV. The quoted result is obtained assuming effective couplings κ_{gluon} and κ_{γ} for $gg \rightarrow H$ and $H \rightarrow \gamma \gamma$, respectively and other couplings fixed to the SM values. See their Fig. 15.

²ATLAS 22 report combined results (see their Extended Data Table 1) using up to 139 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV, assuming $m_{\rm H} = 125.09$ GeV. Coupling strength modifiers including effective photon, $Z\gamma$ and gluon are measured. See their Fig. 6.

 ${}^{3}B_{inv} = B_{undetected} = 0$ is assumed.

 ${}^4B_{inv}$ floating, $B_{undetected} \geq$ 0, and $\kappa_V \leq$ 1 are assumed.

⁵ CMS 22 report combined results (see their Extended Data Table 2) using up to 138 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV, assuming $m_H = 125.38$ GeV. Coupling strength modifiers including effective photon, $Z\gamma$ and gluon are measured. See their Fig. 4 left.

NODE=S126KTA;LINKAGE=A

NODE=S126KTA;LINKAGE=F

NODE=S126KTA;LINKAGE=B

NODE=S126KTA;LINKAGE=E

NODE=S126KTA;LINKAGE=C

NODE=S126KTA;LINKAGE=G

NODE=S126KTA;LINKAGE=D

NODE=S126KMU NODE=S126KMU

OCCUR=2

OCCUR=3

OCCUR=2

NODE=S126KMU;LINKAGE=A

NODE=S126KMU;LINKAGE=F

NODE=S126KMU;LINKAGE=B

NODE=S126KMU;LINKAGE=E

NODE=S126KMU;LINKAGE=C

NODE=S126KMU;LINKAGE=G

NODE=S126KMU;LINKAGE=D

NODE=S126KGC NODE=S126KGC

OCCUR=2

NODE=S126KGC;LINKAGE=E

NODE=S126KGC;LINKAGE=A

NODE=S126KGC;LINKAGE=D NODE=S126KGC;LINKAGE=C NODE=S126KGC;LINKAGE=B

gluon effective couplin	<u> </u>	ID TEC	N COMMENT	NODE=S126KGL NODE=S126KGL
• • • We do not use the f	following data for aver	ages, fits, limi	ts, etc. • • •	
$1.01 \substack{+0.11 \\ -0.09}$	¹ AAD	23Y ATI	_S <i>pp</i> , 13 TeV	
0.05 ± 0.07	^{2,3} ATLAS	22 ATI	_S <i>pp</i> , 13 TeV	
$0.94 \substack{+0.07 \\ -0.06}$	^{2,4} ATLAS	22 ATI	_S <i>pp</i> , 13 TeV	OCCUR=2
0.92 ± 0.08	⁵ CMS	22 CM	S <i>pp</i> , 13 TeV	
pp collision data at $Ecouplings \kappa_{gluon} andfixed to the SM values$	$c_{ m cm}=13~{ m TeV}.$ The c κ_γ for $gg ightarrowH$ and 5. See their Fig. 15.	uoted result is $H \rightarrow \gamma \gamma$, res	with $H \rightarrow \gamma \gamma$ with 139 fb ⁻¹ s obtained assuming effective pectively and other couplings	NODE=S126KGL;LINKAGE=D
$139 { m fb}^{-1}$ of data at E modifiers including effective	${ m cm}=13$ TeV, assumetrive photon, $Z\gamma$ and	heir Extended iing $m_{H} = 12$ Igluon are mea	Data Table 1) using up to 5.09 GeV. Coupling strength sured. See their Fig. 6.	NODE=S126KGL;LINKAGE=A
${}^{3}B_{inv} = B_{undetected}$		< 1 are accur	nod	NODE=S126KGL;LINKAGE=E
${}^{4}B_{inv}$ floating, B_{undet} ${}^{5}CMS$ 22 report combin of data at $E_{cm} = 13$ including effective pho	ed results (see their Ex TeV, assuming <i>m_H</i> =	ktended Data 7 = 125.38 GeV.	able 2) using up to 138 fb ⁻¹ Coupling strength modifiers	NODE=S126KGL;LINKAGE=C NODE=S126KGL;LINKAGE=B
$Z\gamma$ effective coupling	$(\kappa_{Z\gamma})$			NODE=S126KZG
VALUE	DOCUMENT		<u>N</u> <u>COMMENT</u>	NODE=S126KZG
• • We do not use the t	-	-		
$38^{+0.31}_{-0.37}$	^{1,2} ATLAS	22 ATI	_S <i>pp</i> , 13 TeV	
$35^{+0.29}_{-0.36}$	1,3 ATLAS	22 ATI	_S <i>pp</i> , 13 TeV	OCCUR=2
$.65^{+0.34}_{-0.37}$	⁴ CMS	22 CM	S <i>pp</i> , 13 TeV	
modifiers including effective $B_{inv} = B_{undetected}$	ective photon, $Z\gamma$ and $=$ 0 is assumed.	l gluon are me	i.09 GeV. Coupling strength asured. See their Fig. 6.	NODE=S126KZG;LINKAGE=D
modifiers including effective ${}^{2}B_{inv} = B_{undetected}$ ${}^{3}B_{inv}$ floating, B_{undet} 4 CMS 22 report combin	ective photon, $Z\gamma$ and = 0 is assumed. $tected \geq 0$, and κ_V red results (see their Ex- TeV, assuming m_H =	l gluon are me ≤ 1 are assu <tended 7<br="" data="">= 125.38 GeV.</tended>	asured. See their Fig. 6. med. Table 2) using up to 138 fb ⁻¹ Coupling strength modifiers	
modifiers including effective photon ${}^{2}B_{inv} = B_{undetected}$ ${}^{3}B_{inv}$ floating, B_{undet} 4 CMS 22 report combin of data at $E_{cm} = 13$ including effective pho	ective photon, $Z\gamma$ and = 0 is assumed. $tected \geq 0$, and κ_V red results (see their Ex- TeV, assuming m_H =	I gluon are me ≤ 1 are assu ktended Data 7 = 125.38 GeV. e measured. Se	asured. See their Fig. 6. med. Table 2) using up to 138 fb ⁻¹ Coupling strength modifiers their Fig. 4 left.	NODE=S126KZG;LINKAGE=D NODE=S126KZG;LINKAGE=C NODE=S126KZG;LINKAGE=B NODE=S126240
modifiers including effective ${}^{2}B_{inv} = B_{undetected}$ ${}^{3}B_{inv}$ floating, B_{undet} 4 CMS 22 report combin of data at $E_{cm} = 13$ including effective pho OTH	ective photon, $Z\gamma$ and = 0 is assumed. $tected \geq 0$, and κ_V the results (see their Ex- TeV, assuming m_H = ton, $Z\gamma$ and gluon are IER H PRODUCT	f gluon are me ≤ 1 are assu ktended Data 7 = 125.38 GeV. e measured. Se ION PROPE	asured. See their Fig. 6. med. Table 2) using up to 138 fb ⁻¹ Coupling strength modifiers their Fig. 4 left.	NODE=S126KZG;LINKAGE=C NODE=S126KZG;LINKAGE=B NODE=S126240 NODE=S126STH
modifiers including effective ${}^{2}B_{inv} = B_{undetected}$ ${}^{3}B_{inv}$ floating, B_{undet} 4 CMS 22 report combin of data at $E_{cm} = 13$ including effective pho OTH t T H Production Signal strength relat VALUE	ective photon, $Z\gamma$ and = 0 is assumed. $tected \geq 0$, and κ_V led results (see their E: TeV, assuming m_H = iton, $Z\gamma$ and gluon and IER H PRODUCT tive to the Standard M <u>DOCUMENT ID</u>	f gluon are me ≤ 1 are assu ktended Data 7 = 125.38 GeV. e measured. Se ION PROPE	asured. See their Fig. 6. med. Table 2) using up to 138 fb ⁻¹ Coupling strength modifiers their Fig. 4 left. RTIES	NODE=S126KZG;LINKAGE=C NODE=S126KZG;LINKAGE=B NODE=S126240
modifiers including effective modifiers including effective ${}^{2}B_{inv} = B_{undetected}$ ${}^{3}B_{inv}$ floating, B_{undet} 4 CMS 22 report combin of data at $E_{cm} = 13$ including effective pho OTH Signal strength relat (ALUE 1.10±0.18 OUR AVER	ective photon, $Z\gamma$ and = 0 is assumed. $tected \ge 0$, and κ_V the results (see their Ex- TeV, assuming $m_H = 0$ the tot, $Z\gamma$ and gluon and IER H PRODUCT tive to the Standard M <u>DOCUMENT ID</u>	f gluon are me ≤ 1 are assu ktended Data 1 = 125.38 GeV. a measured. Se ION PROPE 10del cross sec <u>TECN</u>	asured. See their Fig. 6. med. Table 2) using up to 138 fb ⁻¹ Coupling strength modifiers their Fig. 4 left. RTIES	NODE=S126KZG;LINKAGE=C NODE=S126KZG;LINKAGE=B NODE=S126240 NODE=S126STH NODE=S126STH
modifiers including effective modifiers including effected ² $B_{inv} = B_{undetected}$ ³ B_{inv} floating, B_{undet} ⁴ CMS 22 report combin of data at $E_{cm} = 13$ including effective pho OTH 5 7 7 7 7 7 7 7 7	ective photon, $Z\gamma$ and = 0 is assumed. $tected \ge 0$, and κ_V the results (see their Ex- TeV, assuming m_H = ton, $Z\gamma$ and gluon and IER H PRODUCT tive to the Standard M <u>DOCUMENT ID</u> AGE ¹ SIRUNYAN	\leq 1 are assu ktended Data T = 125.38 GeV. a measured. So ION PROPE Nodel cross sec <u>TECN</u> 21R CMS	asured. See their Fig. 6. med. Table 2) using up to 138 fb ⁻¹ Coupling strength modifiers their Fig. 4 left. RTIES tion. <u>COMMENT</u> pp , 13 TeV, $H \rightarrow \tau \tau$, WW^* , ZZ^*	NODE=S126KZG;LINKAGE=C NODE=S126KZG;LINKAGE=B NODE=S126240 NODE=S126STH NODE=S126STH NODE=S126STH
modifiers including effective modifiers including effected ${}^{2}B_{inv} = B_{undetected}$ ${}^{3}B_{inv}$ floating, B_{undet} 4 CMS 22 report combin of data at $E_{cm} = 13$ including effective pho OTH TH Production Signal strength relate <u>ALUE</u> 1.10±0.18 OUR AVERA $0.92\pm0.19^{+0.17}_{-0.13}$ 1.2 ± 0.3	ective photon, $Z\gamma$ and = 0 is assumed. $tected \ge 0$, and κ_V the results (see their Ex- TeV, assuming $m_H = 0$ the tot, $Z\gamma$ and gluon and IER H PRODUCT tive to the Standard M <u>DOCUMENT ID</u>	\leq 1 are assu ktended Data T = 125.38 GeV. a measured. So ION PROPE Nodel cross sec <u>TECN</u> 21R CMS	asured. See their Fig. 6. med. Table 2) using up to 138 fb ⁻¹ Coupling strength modifiers see their Fig. 4 left. RTIES tion. <u>COMMENT</u> pp , 13 TeV, $H \rightarrow \tau \tau$,	NODE=S126KZG;LINKAGE=C NODE=S126KZG;LINKAGE=B NODE=S126240 NODE=S126STH NODE=S126STH NODE=S126STH OCCUR=2
modifiers including effective modifiers including effected ${}^{2}B_{inv} = B_{undetected}$ ${}^{3}B_{inv}$ floating, B_{undet} 4 CMS 22 report combin of data at $E_{cm} = 13$ including effective pho OTH TH Production Signal strength related <u>ALUE</u> 1.10±0.18 OUR AVERA $0.92\pm0.19^{+0.17}_{-0.13}$	ective photon, $Z\gamma$ and = 0 is assumed. $tected \ge 0$, and κ_V the results (see their Ex- TeV, assuming m_H = ton, $Z\gamma$ and gluon and IER H PRODUCT tive to the Standard M <u>DOCUMENT ID</u> AGE ¹ SIRUNYAN	d gluon are me ≤ 1 are assu ktended Data T = 125.38 GeV. = measured. Se ION PROPE Model cross sec <u>TECN</u> 21R CMS 18AC ATLS	asured. See their Fig. 6. med. Table 2) using up to 138 fb ⁻¹ Coupling strength modifiers see their Fig. 4 left. RTIES tion. <u>COMMENT</u> $pp, 13 \text{ TeV}, H \rightarrow \tau\tau,$ WW^*, ZZ^* $pp, 13 \text{ TeV}, H \rightarrow b\overline{b} \tau\tau,$	NODE=S126KZG;LINKAGE=C NODE=S126KZG;LINKAGE=B NODE=S126240 NODE=S126STH NODE=S126STH NODE=S126STH
modifiers including effective modifiers including effective modifiers including effected ${}^{3}B_{inv}$ floating, B_{undee} ${}^{4}CMS 22$ report combin of data at $E_{cm} = 13$ including effective pho OTH TH Production Signal strength related \underline{ALUE} 1.10±0.18 OUR AVERA $0.92\pm0.19 {}^{+0.17}_{-0.13}$ 1.2 ± 0.3 $1.9 {}^{+0.8}_{-0.7}$	ective photon, $Z\gamma$ and = 0 is assumed. $tected \ge 0$, and κ_V red results (see their E: TeV, assuming m_H = iton, $Z\gamma$ and gluon and IER H PRODUCT tive to the Standard M <u>DOCUMENT ID</u> AGE ¹ SIRUNYAN ² AABOUD ³ AAD	d gluon are me ≤ 1 are assu ktended Data T = 125.38 GeV. e measured. Se ION PROPE Model cross sec <u>TECN</u> 21R CMS 18AC ATLS 16AN ATLS	asured. See their Fig. 6. med. Table 2) using up to 138 fb ⁻¹ Coupling strength modifiers their Fig. 4 left. CRTIES tion. <u>COMMENT</u> $pp, 13 \text{ TeV}, H \rightarrow \tau\tau,$ WW^*, ZZ^* $pp, 13 \text{ TeV}, H \rightarrow b\overline{b} \tau\tau,$ $\gamma\gamma, WW^*, ZZ^*$ pp, 7, 8 TeV	NODE=S126KZG;LINKAGE=C NODE=S126KZG;LINKAGE=B NODE=S126240 NODE=S126STH NODE=S126STH NODE=S126STH OCCUR=2
modifiers including effective modifiers including effected ² $B_{inv} = B_{undetected}$ ³ B_{inv} floating, B_{undet} ⁴ CMS 22 report combin of data at $E_{cm} = 13$ including effective pho OTH 5 7 7 7 7 7 7 7 7	ective photon, $Z\gamma$ and = 0 is assumed. $tected \ge 0$, and κ_V red results (see their E: TeV, assuming m_H = iton, $Z\gamma$ and gluon and IER H PRODUCT tive to the Standard M <u>DOCUMENT ID</u> AGE ¹ SIRUNYAN ² AABOUD ³ AAD	I gluon are me ≤ 1 are assu tended Data 1 = 125.38 GeV. a measured. Se ION PROPE 10del cross sec <u>TECN</u> 21R CMS 18AC ATLS 16AN ATLS rages, fits, limited 218 CMS	asured. See their Fig. 6. med. Table 2) using up to 138 fb ⁻¹ Coupling strength modifiers their Fig. 4 left. CRTIES tion. <u>COMMENT</u> $pp, 13 \text{ TeV}, H \rightarrow \tau\tau,$ WW^*, ZZ^* $pp, 13 \text{ TeV}, H \rightarrow b\overline{b} \tau\tau,$ $\gamma\gamma, WW^*, ZZ^*$ pp, 7, 8 TeV	NODE=S126KZG;LINKAGE=C NODE=S126KZG;LINKAGE=B NODE=S126240 NODE=S126STH NODE=S126STH NODE=S126STH OCCUR=2
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modifiers including effective ² $B_{inv} = B_{undetected}$ ³ B_{inv} floating, B_{undet} ⁴ CMS 22 report combin of data at $E_{cm} = 13$ including effective pho OTH 5 TH Production Signal strength relate ALUE 1.10±0.18 OUR AVERA $0.92 \pm 0.19 + 0.17$ $0.92 \pm 0.19 + 0.17$ 1.2 ± 0.3 1.2 ± 0.3 1.9 + 0.8 -0.27 + 0.86 -0.27 + 0.86 -0.35 + 0.36 -0.34	ective photon, $Z\gamma$ and = 0 is assumed. $tected \ge 0$, and κ_V and results (see their Ex- TeV, assuming m_H = iton, $Z\gamma$ and gluon and IER H PRODUCT tive to the Standard M <u>DOCUMENT ID</u> AGE ¹ SIRUNYAN ² AABOUD ³ AAD following data for aven ⁴ TUMASYAN ⁵ AAD	f gluon are me ≤ 1 are assu ktended Data T = 125.38 GeV. = measured. So ION PROPE fodel cross sec <u>TECN</u> 21R CMS 18AC ATLS 16AN ATLS rages, fits, limitical 23AI ATLS 22M ATLS	asured. See their Fig. 6. med. Table 2) using up to 138 fb ⁻¹ Coupling strength modifiers be their Fig. 4 left. IRTIES tion. <u>COMMENT</u> $pp, 13 \text{ TeV}, H \rightarrow \tau\tau,$ WW^*, ZZ^* $pp, 13 \text{ TeV}, H \rightarrow b\overline{b}\tau\tau,$ $\gamma\gamma, WW^*, ZZ^*$ pp, 7, 8 TeV ts, etc. ••• $pp, 13 \text{ TeV}, boosted H \rightarrow b\overline{b}$ $pp, 13 \text{ TeV}, H \rightarrow b\overline{b}$	NODE=S126KZG;LINKAGE=C NODE=S126KZG;LINKAGE=B NODE=S126240 NODE=S126STH NODE=S126STH NODE=S126STH OCCUR=2
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modifiers including effective ² $B_{inv} = B_{undetected}$ ³ B_{inv} floating, B_{undet} ⁴ CMS 22 report combin of data at $E_{cm} = 13$ including effective pho OTH t T H Production Signal strength relative 1.10±0.18 OUR AVERA $0.92\pm0.19^{+0.17}_{-0.13}$ 1.2 ±0.3 1.2 ±0.3 1.9 $^{+0.8}_{-0.7}$ • • We do not use the formula of the second strength of the second stren	ective photon, $Z\gamma$ and = 0 is assumed. $tected \ge 0$, and κ_V red results (see their E: TeV, assuming m_H = iton, $Z\gamma$ and gluon and IER H PRODUCT tive to the Standard M DOCUMENT ID 1 SIRUNYAN 2 AABOUD 3 AAD following data for aven 4 TUMASYAN 5 AAD 6 AAD 7 SIRUNYAN 8 SIRUNYAN	≤ 1 are assu ktended Data T = 125.38 GeV. a measured. Se ION PROPE 10del cross sec 21R CMS 18AC ATLS 16AN ATLS 16AN ATLS 23AI ATLS 22M ATLS 20Z ATLS 20AS CMS 19R CMS	asured. See their Fig. 6. med. Table 2) using up to 138 fb ⁻¹ Coupling strength modifiers see their Fig. 4 left. IRTIES tion. <u>COMMENT</u> $pp, 13 \text{ TeV}, H \rightarrow \tau\tau,$ WW^*, ZZ^* $pp, 13 \text{ TeV}, H \rightarrow b\overline{b}\tau\tau,$ $\gamma\gamma, WW^*, ZZ^*$ pp, 7, 8 TeV ts, etc. ••• $pp, 13 \text{ TeV}, boosted H \rightarrow b\overline{b}$ $pp, 13 \text{ TeV}, H \rightarrow b\overline{b}$ $pp, 13 \text{ TeV}, H \rightarrow b\overline{b}$ $pp, 13 \text{ TeV}, H \rightarrow \gamma\gamma$ $pp, 13 \text{ TeV}, H \rightarrow b\overline{b}$	NODE=S126KZG;LINKAGE=C NODE=S126KZG;LINKAGE=B NODE=S126240 NODE=S126STH NODE=S126STH NODE=S126STH OCCUR=2
modifiers including effective ² $B_{inv} = B_{undetected}$ ³ B_{inv} floating, B_{undet} ⁴ CMS 22 report combin of data at $E_{cm} = 13$ including effective pho OTH t TH Production Signal strength relative 1.10±0.18 OUR AVERA $0.92\pm0.19^{+0.17}_{-0.13}$ 1.2 ±0.3 1.9 +0.8 $-0.27^{+0.86}_{-0.83}$ $0.35^{+0.36}_{-0.34}$ $1.43^{+0.33}_{-0.31}^{+0.21}_{-0.15}$ $1.38^{+0.36}_{-0.29}$ $0.72\pm0.24\pm0.38$ $1.6^{+0.5}_{-0.4}$	ective photon, $Z\gamma$ and = 0 is assumed. $tected \ge 0$, and κ_V and results (see their Ex- TeV, assuming m_H = iton, $Z\gamma$ and gluon and IER <i>H</i> PRODUCT tive to the Standard M <u>DOCUMENT ID</u> AGE ¹ SIRUNYAN ² AABOUD ³ AAD following data for aver ⁴ TUMASYAN ⁵ AAD ⁶ AAD ⁷ SIRUNYAN ⁸ SIRUNYAN ⁹ AABOUD	≤ 1 are assu ktended Data T = 125.38 GeV. a measured. Se ION PROPE 10del cross sec <u>TECN</u> 21R CMS 18AC ATLS 16AN ATLS 16AN ATLS 23AI ATLS 20A ATLS 20AS CMS 19R CMS 18AC ATLS	asured. See their Fig. 6. med. Table 2) using up to 138 fb ⁻¹ Coupling strength modifiers be their Fig. 4 left. RTIES tion. <u>COMMENT</u> $pp, 13 \text{ TeV}, H \rightarrow \tau\tau,$ WW^*, ZZ^* $pp, 13 \text{ TeV}, H \rightarrow b\overline{b}\tau\tau,$ $\gamma\gamma, WW^*, ZZ^*$ pp, 7, 8 TeV ts, etc. • • • $pp, 13 \text{ TeV}, boosted H \rightarrow b\overline{b}$ $pp, 13 \text{ TeV}, H \rightarrow \tau\tau,$ WW^*, ZZ^* $pp, 13 \text{ TeV}, H \rightarrow b\overline{b}$ $pp, 13 \text{ TeV}, H \rightarrow b\overline{b}$	NODE=S126KZG;LINKAGE=C NODE=S126KZG;LINKAGE=B NODE=S126240 NODE=S126STH NODE=S126STH NODE=S126STH OCCUR=2
modifiers including effective ${}^{2}B_{inv} = B_{undetected}$ ${}^{3}B_{inv}$ floating, B_{undet} 4 CMS 22 report combin of data at $E_{cm} = 13$ including effective pho OTH t $\overline{t}H$ Production Signal strength relative 1.10±0.18 OUR AVERA $0.92\pm0.19^{+0.17}_{-0.13}$ 1.2 ± 0.3 1.2 ± 0.3 $1.9 \stackrel{+0.8}{-0.7}$ • We do not use the formula of the strength of the str	ective photon, $Z\gamma$ and = 0 is assumed. $tected \ge 0$, and κ_V hed results (see their Ex- TeV, assuming m_H = iton, $Z\gamma$ and gluon and IER H PRODUCT tive to the Standard M DOCUMENT ID AGE 1 SIRUNYAN 2 AABOUD 3 AAD following data for aven 4 TUMASYAN 5 AAD 6 AAD 7 SIRUNYAN 8 SIRUNYAN 9 AABOUD 10 AABOUD	I gluon are me ≤ 1 are assu attended Data 1 = 125.38 GeV. a measured. Se ION PROPE Model cross sec <u>TECN</u> 21R CMS 18AC ATLS 16AN ATLS 16AN ATLS 22M ATLS 20AS CMS 19R CMS 18AC ATLS 18AC ATLS 18AC ATLS 18AC ATLS 18AC ATLS 18AC ATLS 18AC ATLS 18AC ATLS	asured. See their Fig. 6. med. Table 2) using up to 138 fb ⁻¹ Coupling strength modifiers see their Fig. 4 left. RTIES tion. <u>COMMENT</u> $pp, 13 \text{ TeV}, H \rightarrow \tau\tau,$ WW^*, ZZ^* $pp, 13 \text{ TeV}, H \rightarrow b\overline{b}\tau\tau,$ $\gamma\gamma, WW^*, ZZ^*$ pp, 7, 8 TeV ts, etc. ••• $pp, 13 \text{ TeV}, boosted H \rightarrow b\overline{b}$ $pp, 13 \text{ TeV}, H \rightarrow b\overline{b}$ $pp, 13 \text{ TeV}, H \rightarrow b\overline{b}$ $pp, 13 \text{ TeV}, H \rightarrow \phi\gamma$ $pp, 13 \text{ TeV}, H \rightarrow \psi$	NODE=S126KZG;LINKAGE=C NODE=S126KZG;LINKAGE=B NODE=S126240 NODE=S126STH NODE=S126STH NODE=S126STH OCCUR=2

18BQ CMS pp, 13 TeV, $H \rightarrow \tau \tau$, $W W^*$, $Z Z^*$

$1.26 \substack{+0.31 \\ -0.26}$	¹⁴ SIRUNYAN	18L CMS	pp, 7, 8, 13 TeV, $H ightarrow$ $b \overline{b}, \tau au, \gamma \gamma, W W^*,$	
1.7 ±0.8	¹⁵ AAD	16AL ATLS	Z Z* _	
1.7 ±0.8	AAD	IUAL ATES		
$2.3 \ +0.7 \ -0.6$	3,16 _{AAD}	16AN LHC	рр, 7, 8 TeV	
$2.9 \ +1.0 \ -0.9$	³ AAD	16AN CMS	<i>pp</i> , 7, 8 TeV	OCCUR=3
$-0.9 \\ 1.81 + 0.52 + 0.58 + 0.31 \\ -0.50 - 0.55 - 0.12$	¹⁷ AAD	16к ATLS	pp, 7, 8 TeV	
$1.4 \begin{array}{c} +2.1 \\ -1.4 \end{array} \begin{array}{c} +0.6 \\ -0.3 \end{array}$	¹⁸ AAD	15 ATLS	рр, 7, 8 ТеV	
-1.4 - 0.3 1.5 ± 1.1	¹⁹ AAD	15BC ATLS		
$2.1 \ +1.4 \ -1.2$	²⁰ AAD	15⊤ ATLS		
-1.2 1.2 + 1.6 -1.5	²¹ KHACHATRY	15AN CMS	<i>pp</i> , 8 TeV	
-1.5 2.8 $+1.0$ -0.9	²² KHACHATRY		pp, 7, 8 TeV	
-0.9 9.49 $+6.60$ -6.28	²³ AALTONEN	13L CDF	<i>pp</i> , 1.96 TeV	OCCUR=2
^{9.49} -6.28 < 5.8 at 95% CL	²⁴ CHATRCHYA		pp, 1.90 TeV pp , 7, 8 TeV, $H \rightarrow b\overline{b}$	
			rons, muons and hadronically	
decaying τ leptons (H	$\rightarrow WW^*, ZZ^*,$	$\tau \tau$) with 137	r^{1} of pp collision data at a significance of 4.7 standard	NODE=S126STH;LINKAGE=W
² AABOUD 18AC combi $\ell\ell\nu\nu, \ell\ell q \overline{q}$) with res	ne results of $t \overline{t} H, H$ ults of $t \overline{t} H, H \rightarrow k$	$\rightarrow \tau \tau$, WW $\overline{b}\overline{b}$ (AABOUD	$ \overset{\prime*}{(\rightarrow \ell \nu \ell \nu, \ell \nu q \overline{q}), ZZ^{*}(\rightarrow 0.18T), \gamma \gamma \text{ (AABOUD 18BO),} } $	NODE=S126STH;LINKAGE=N
$ZZ^*(\rightarrow 4\ell)$ (AABOU	JD 18AJ) in 36.1 fb ⁻	$^{-1}$ of <i>pp</i> collines of <i>pp</i> collines (1)	sions at $E_{\rm cm}=13$ TeV. The heir Table 14.	
³ AAD 16AN: In the fit, 1	relative branching ration	os are fixed to	those in the Standard Model.	NODE=S126STH;LINKAGE=K
The quoted signal stre ⁴ TUMASYAN 23AI mea			GeV) in <i>tTH</i> production using	NODE=S126STH;LINKAGE=Z
138 fb $^{-1}$ of data at ${\it E}$	$E_{\rm cm}=13$ TeV. The d	lifferential cro	ss section for the Higgs p_T is	NODE-51205 HI,EINRAGE-2
shown in their Fig. 8 a CL are shown in their	and Table V. Limits or Fig. 10 and Table VI.	n eight Wilsor	1 coefficients at 68% and 95%	
⁵ AAD 22M measure <i>H</i>	$\rightarrow b\overline{b}$ in $t\overline{t}H$ produce	ction using 13	39 fb ⁻¹ of data at $E_{\rm cm} = 13$	NODE=S126STH;LINKAGE=Y
simplified template cro	iss section bins are give	/en in their Fi	cross section upper limits with gs. 18 and 19, respectively.	
⁶ AAD 20Z measure $\sigma_{t \overline{t}}$ at $E_{\rm cm} = 13$ TeV.	$H \cdot B(H o \gamma \gamma)$ to b	be 1.64 ^{+0.38} -0.36	+0.17 fb in 139 fb ⁻¹ of data -0.14	NODE=S126STH;LINKAGE=V
⁷ SIRUNYAN 20AS meas	sure $\sigma_{t\overline{t}H} \cdot B(H o \gamma)$	γ) to be 1.56	$^{+0.34}_{-0.32}$ fb in 137 fb $^{-1}$ of data	NODE=S126STH;LINKAGE=U
at $E_{ m cm}=13$ TeV.			ng to $b\overline{b}$ in 35.9 fb ⁻¹ of data	
at ${m E_{\sf cm}}=13$ TeV. Th	e quoted signal streng	gth is given fo	$m_H = 125 \text{ GeV}.$	NODE=S126STH;LINKAGE=S
⁹ AABOUD 18AC search	for $t\overline{t}H$ production	with H decay	Ving to $\tau \tau$, $WW^*(\rightarrow \ell \nu \ell \nu$,	NODE=S126STH;LINKAGE=M
quoted signal strength	is given for $m_H = 12$	25 GeV. See t	sions at $E_{\rm CM} = 13$ TeV. The heir Table 13 and Fig. 13.	
¹⁰ AABOUD 18BK use 79	.8 fb $^{-1}$ data for $t \overline{t} H$	production w	with $H \rightarrow \gamma \gamma$ and $ZZ^* \rightarrow 4\ell$	NODE=S126STH;LINKAGE=O
$(\ell=e,\mu)$ and 36.1 fb 5.8 standard deviations	for other decay ch is observed for $m_H =$	1annels at <i>E</i> _{CI} = 125.09 GeV	$_{ m m}=13$ TeV. A significance of and its signal strength without	
the uncertainty of the	<i>tTH</i> cross section is 1	$32^{+0.28}_{-0.26}$. C	ombining with results of 7 and	
			ns. Assuming Standard Model n at 13 TeV is measured to be	
$670 \pm 90^{+110}_{-100}$ fb.				
¹¹ AABOUD 18⊤ search	for $t\overline{t}H$ production v 3 TeV. The quoted signals	with <i>H</i> decayi	ng to $b\overline{b}$ in 36.1 fb ⁻¹ of pp is given for $m_H = 125$ GeV.	NODE=S126STH;LINKAGE=H
¹² SIRUNYAN 18BD sear	ch for $t \overline{t} H, H \rightarrow b \overline{b}$	in the all-jet	final state with 35.9 fb $^{-1}$ pp	NODE=S126STH;LINKAGE=Q
¹³ SIRUNYAN 18BQ sear	= 13 TeV. The quoted ch for $t\bar{t}H$ in final sta	ates with elec	th is given for $m_{H} = 125$ GeV. trons, muons and hadronically	NODE=S126STH;LINKAGE=P
decaying $ au$ leptons (H	$\rightarrow WW^*, ZZ^*,$ uoted signal strength	au au) with 35.9 corresponds to) fb ⁻¹ of pp collision data at b a significance of 3.2 standard	
			collisions at $E_{\rm cm}=$ 7, 8, and ponds to a significance of 5.2	NODE=S126STH;LINKAGE=G
standard deviations an	d is given for $m_H =$	125.09 GeV.	H decay channels of WW^* ,	
ZZ^* , $\gamma\gamma$, $\tau\tau$, and $b\overline{b}$ channels.	are used. See their	Table 1 and F	ig. 2 for results on individual	
15 AAD 16AL search for t			$\gamma \gamma$ in 4.5 fb ⁻¹ of <i>pp</i> collisions 20.3 fb ⁻¹ at $E_{cm} = 8$ TeV.	NODE=S126STH;LINKAGE=I

The quoted signal strength is given for $m_H = 125$ GeV. This paper combines the results of previous papers, and the new result of this paper only is: $\mu = 1.6 \pm 2.6$.

 16 AAD 16AN perform fits to the ATLAS and CMS data at $E_{\rm cm}=$ 7 and 8 TeV.

- ¹⁷ AAD 16K use up to 4.7 fb⁻¹ of *pp* collisions at $E_{\rm cm} = 7$ TeV and up to 20.3 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The third uncertainty in the measurement is theory systematics. The quoted signal strength is given for $m_H = 125.36$ GeV.
- ¹⁸ AAD 15 search for $t\bar{t}H$ production with H decaying to $\gamma\gamma$ in 4.5 fb⁻¹ of pp collisions at $E_{\rm cm} = 7$ TeV and 20.3 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The quoted result on the signal strength is equivalent to an upper limit of 6.7 at 95% CL and is given for $m_H = 125.4$ GeV.
- ¹⁹ AAD 15BC search for $t\bar{t}H$ production with H decaying to $b\bar{b}$ in 20.3 fb⁻¹ of pp collisions at $E_{\rm cm} = 8$ TeV. The corresponding upper limit is 3.4 at 95% CL. The quoted signal strength is given for $m_{\rm H} = 125$ GeV.
- 20 AAD 15T search for $t\,\overline{t}\,H$ production with H resulting in multilepton final states (mainly from $W\,W^*,\,\tau\tau,\,ZZ^*)$ in 20.3 fb $^{-1}$ of $p\,p$ collisions at $E_{\rm CM}=8$ TeV. The quoted result on the signal strength is given for $m_H=125$ GeV and corresponds to an upper limit of 4.7 at 95% CL. The data sample is independent from AAD 15 and AAD 15BC.
- ²¹ KHACHATRYAN 15AN search for $t\bar{t}H$ production with H decaying to $b\bar{b}$ in 19.5 fb⁻¹ of pp collisions at $E_{\rm cm} = 8$ TeV. The quoted result on the signal strength is equivalent to an upper limit of 4.2 at 95% CL and is given for $m_H = 125$ GeV.
- ²² KHACHATRYAN 14H search for $t\bar{t}H$ production with H decaying to $b\bar{b}$, $\tau\tau$, $\gamma\gamma$, WW^* , and ZZ^* , in 5.1 fb⁻¹ of pp collisions at $E_{\rm cm} = 7$ TeV and 19.7 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The quoted signal strength is given for $m_H = 125.6$ GeV.
- ²³ AALTONEN 13L combine all CDF results with 9.45–10.0 fb⁻¹ of $p\overline{p}$ collisions at $E_{\rm cm}$ = 1.96 TeV. The quoted signal strength is given for m_H = 125 GeV.
- ²⁴ CHATRCHYAN 13X search for $t\bar{t}H$ production followed by $H \rightarrow b\bar{b}$, one top decaying to $\ell\nu$ and the other to either $\ell\nu$ or $q\bar{q}$ in 5.0 fb⁻¹ and 5.1 fb⁻¹ of pp collisions at $E_{\rm cm} = 7$ and 8 TeV. A limit on cross section times branching ratio which corresponds to (4.0-8.6) times the expected Standard Model cross section is given for $m_H = 110-140$ GeV at 95% CL. The quoted limit is given for $m_H = 125$ GeV, where 5.2 is expected for no signal.

HH Production Cross Section in pp Collisions

The HH production cross section relative to the SM prediction.

VAL		CL%	DOCUMENT ID	TECN	COMMENT
			[<12.7 OUR 2019 E		
	2.4	95	¹ AAD	23AT ATLS	13 TeV, $b\overline{b}b\overline{b}$, $b\overline{b}\tau\tau$, $b\overline{b}\gamma\gamma$
		ot use t	he following data for	averages, fits	· · · -
$<\!\!1$	83	95	² AAD	23AD ATLS	13 TeV, VHH , $HH \rightarrow b\overline{b}b\overline{b}$
<	5.4	95	³ AAD	23BK ATLS	13 TeV, $b\overline{b}b\overline{b}$
<	4.7	95	⁴ AAD	23z ATLS	13 TeV, $b\overline{b}\tau\tau$
<	9.9	95	⁵ TUMASYAN	23AE CMS	13 TeV, bbbb
<	3.3	95	^{6,7} TUMASYAN	23D CMS	13 TeV, $b\overline{b} au au$
$<\!\!1$	24	95	^{6,8} TUMASYAN	23D CMS	13 TeV, $b\overline{b}\tau\tau$
<	32.4	95	⁹ TUMASYAN	23I CMS	13 TeV, $b \overline{b} Z Z^* (Z Z^* \rightarrow 4\ell)$
<	21.3	95	¹⁰ TUMASYAN	230 CMS	13 TeV, <i>W W* W W*</i> ,
					$WW^*\tau\tau, \tau\tau\tau\tau$
<	4.2	95	¹¹ AAD	22Y ATLS	13 TeV, $\gamma \gamma b \overline{b}$
<	3.4	95	¹² CMS	22 CMS	13 TeV, $b\overline{b}ZZ^*$, $b\overline{b}\gamma\gamma$, $b\overline{b}\tau\tau$,
			10		$b\overline{b}b\overline{b}$, multilepton
<	3.9	95	¹³ TUMASYAN	22AN CMS	13 TeV, $b\overline{b}b\overline{b}$
<	7.7	95	¹⁴ SIRUNYAN	21K CMS	13 TeV, $\gamma \gamma b \overline{b}$
<	6.9	95	¹⁵ AAD	20c ATLS	13 TeV, $b\overline{b}\gamma\gamma$, $b\overline{b} au au$, $b\overline{b}b\overline{b}$,
					$b\overline{b}WW^*$, $WW^*\gamma\gamma$,
			16		WW^*WW^*
<		95	¹⁶ AAD	20E ATLS	13 TeV, $HH \rightarrow b\overline{b}\ell\nu\ell\nu$
<8		95	17 AAD	20x ATLS	13 TeV, VBF, <i>bbbb</i>
	12.9	95	¹⁸ AABOUD	19A ATLS	13 TeV, $b\overline{b}b\overline{b}$
<3		95	¹⁹ AABOUD	190 ATLS	13 TeV, $b\overline{b}WW^*$
$<\!\!1$	60	95	²⁰ AABOUD	19⊤ ATLS	13 TeV, <i>WW</i> * <i>WW</i> *
<	24	95	²¹ SIRUNYAN	19 CMS	13 TeV, $\gamma \gamma b \overline{b}$
<	75	95	²² SIRUNYAN	19AB CMS	13 TeV, $b\overline{b}b\overline{b}$
<	22.2	95	²³ SIRUNYAN	19BE CMS	13 TeV, $b\overline{b}\gamma\gamma \ b\overline{b}\tau\tau$, $b\overline{b}b\overline{b}$,
			24		<i>b̄WW</i> [*] ,_ <i>b̄̄ZZ</i> [*]
$<\!\!1$		95	²⁴ SIRUNYAN	19н CMS	13 TeV, $b\overline{b}b\overline{b}$
<2		95	²⁵ AABOUD	18BU ATLS	13 TeV, $\gamma \underline{\gamma} W W^*$
	12.7	95	²⁶ AABOUD	18CQ ATLS	13 TeV, $b\overline{b}\tau\tau$
<		95	²⁷ AABOUD	18cwATLS	13 TeV, $\gamma \underline{\gamma} b \overline{b}$
<	30	95	²⁸ SIRUNYAN	18A CMS	13 TeV, $b\overline{b} au au$

NODE=S126STH;LINKAGE=J NODE=S126STH;LINKAGE=F

NODE=S126STH;LINKAGE=B

NODE=S126STH;LINKAGE=C

NODE=S126STH;LINKAGE=D

NODE=S126STH;LINKAGE=E

NODE=S126STH;LINKAGE=A

NODE=S126STH;LINKAGE=LL

NODE=S126STH;LINKAGE=TY

NODE=S126SHH

NODE=S126SHH NODE=S126SHH

OCCUR=2

$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	
¹ AAD 23AT combine results from 126–139 fb ⁻¹ of data at $E_{cm} = 13$ TeV for $pp \rightarrow HH \rightarrow b\overline{b}b\overline{b}$ (AAD 23BK), $b\overline{b}\tau\tau$ (AAD 23Z), and $b\overline{b}\gamma\gamma$ (AAD 22Y).	NODE=S126SHH;LINKAGE=GA
² AAD 23AD search for non-resonant <i>HH</i> production in association with a vector boson using $HH \rightarrow b\bar{b}b\bar{b}$ with data of 139 fb ⁻¹ at $E_{cm} = 13$ TeV. The vector boson decays leptonically ($W \rightarrow \ell\nu, Z \rightarrow \ell\ell, \nu\nu, \ell = e, \mu$).	NODE=S126SHH;LINKAGE=Z
³ AAD 23BK search for non-resonant HH production using $HH \rightarrow b\overline{b}b\overline{b}$ with data of 126 fb ⁻¹ at $E_{cm} = 13$ TeV.	NODE=S126SHH;LINKAGE=FA
⁴ AAD 23Z search for non-resonant <i>HH</i> production using $HH \rightarrow b\bar{b}\tau\tau$ with data of 139 fb ⁻¹ at $E_{\rm cm} = 13$ TeV. The upper limit on the $pp \rightarrow HH$ production cross section at 95% CL is measured to be 140 fb, which corresponds to 4.7 times the SM prediction (see their Table 6).	NODE=S126SHH;LINKAGE=X
⁵ TUMASYAN 23AE search for HH production using $HH \rightarrow b\overline{b}b\overline{b}$, where both $b\overline{b}$ pairs are highly boosted, with data of 138 fb ⁻¹ at $E_{cm} = 13$ TeV.	NODE=S126SHH;LINKAGE=AA
⁶ TUMASYAN 23D search for non-resonant <i>HH</i> production using $HH \rightarrow b\overline{b}\tau\tau$ with data of 138 fb ⁻¹ at $E_{\rm cm} = 13$ TeV.	NODE=S126SHH;LINKAGE=BA
⁷ The upper limit on the $pp \rightarrow HH$ production cross section (gluon fusion and VBF) at 95% CL is measured to be 102 fb, which corresponds to 3.3 times the SM prediction (see their Table 2).	NODE=S126SHH;LINKAGE=DA
⁸ The upper limit on the VBF $pp \rightarrow HH$ production cross section at 95% CL is measured to be 212 fb, which corresponds to 124 times the SM prediction (see their Table 3).	NODE=S126SHH;LINKAGE=CA
⁹ TUMASYAN 23I search for non-resonant <i>HH</i> production using $HH \rightarrow b\overline{b}ZZ^*$ ($ZZ^* \rightarrow 4\ell, \ell = e, \mu$) with data of 138 fb ⁻¹ at $E_{\rm cm} = 13$ TeV.	NODE=S126SHH;LINKAGE=Y
¹⁰ TUMASYAN 230 search for non-resonant <i>HH</i> production using $HH \rightarrow WW^*WW^*$, $WW^*\tau\tau$, and $\tau\tau\tau\tau$ (multilepton) with data of 138 fb ⁻¹ at $E_{\rm cm} = 13$ TeV. See their Fig. 9 for different final states and these combination.	NODE=S126SHH;LINKAGE=EA
¹¹ AAD 22Y search for non-resonant <i>HH</i> production using $HH \rightarrow \gamma\gamma b\overline{b}$ with data of 139 fb ⁻¹ at $E_{\rm cm} = 13$ TeV. The upper limit on the $pp \rightarrow HH$ production cross section at 95% CL is measured to be 130 fb, which corresponds to 4.2 times the SM prediction.	NODE=S126SHH;LINKAGE=V
$^{12}\rm CMS$ 22 report combined results (see their Extended Data Table 2) using 138 fb $^{-1}$ of data at $E_{\rm Cm}=$ 13 TeV. See their Fig. 5 (left) for different final states and these combination.	NODE=S126SHH;LINKAGE=U
¹³ TUMASYAN 22AN search for non-resonant HH production using $HH \rightarrow b\bar{b}b\bar{b}$ with data of 138 fb ⁻¹ at $E_{\rm cm} = 13$ TeV. The upper limit on the $pp \rightarrow HH$ production cross section at 95% CL is measured to be 120 fb, which corresponds to 3.9 times the	NODE=S126SHH;LINKAGE=W
¹⁴ SIRUNYAN 21K search for non-resonant <i>HH</i> production using $HH \rightarrow \gamma\gamma b\overline{b}$ with data of 137 fb ⁻¹ at $E_{\rm cm} = 13$ TeV. The upper limit on the $pp \rightarrow HH \rightarrow \gamma\gamma b\overline{b}$ production	NODE=S126SHH;LINKAGE=T
cross section at 95% CL is measured to be 0.67 fb, which corresponds to about 7.7 times the SM prediction.	
¹⁵ AAD 20C combine results of up to 36.1 fb ⁻¹ data at $E_{cm} = 13$ TeV for $pp \rightarrow HH \rightarrow b\bar{b}\gamma\gamma$, $b\bar{b}\tau\tau$, $b\bar{b}b\bar{b}$, $b\bar{b}WW^*$, $WW^*\gamma\gamma$, WW^*WW^* (AABOUD 18CW, AABOUD 18CQ, AABOUD 19A, AABOUD 19O, AABOUD 18BU, and AABOUD 19T).	NODE=S126SHH;LINKAGE=Q
¹⁶ AAD 20E search non-resonant for <i>HH</i> production using $HH \rightarrow b\bar{b}\ell\nu\ell\nu$, where one of the Higgs bosons decays to $b\bar{b}$ and the other decays to either WW^* , ZZ^* , or $\tau\tau$, with	NODE=S126SHH;LINKAGE=R
data of 139 fb ⁻¹ at $E_{\rm cm}=$ 13 TeV. The upper limit on the $pp \rightarrow HH$ production cross section at 95% CL is measured to be 1.2 pb, which corresponds to about 40 times the SM prediction.	
¹⁷ AAD 20x search for $HH \rightarrow b\bar{b}b\bar{b}$ process via VBF with data of 126 fb ⁻¹ at $E_{cm} =$ 13 TeV. The upper limit on the SM non-resonant HH production cross section is 1460 fb at 95% CL, which corresponds to 840 times the SM prediction.	NODE=S126SHH;LINKAGE=S
¹⁸ AABOUD 19A search for <i>HH</i> production using $HH \rightarrow b\overline{b}b\overline{b}$ with data of 36.1 fb ⁻¹ at $E_{\rm cm} = 13$ TeV. The upper limit on the $pp \rightarrow HH \rightarrow b\overline{b}b\overline{b}$ production cross section at 95% is measured to be 147 fb, which corresponds to about 12.9 times the SM prediction.	NODE=S126SHH;LINKAGE=J
¹⁹ AABOUD 190 search for <i>HH</i> production using $HH \rightarrow b\bar{b}WW^*$ with data of 36.1 fb ⁻¹ at $E_{cm} = 13$ TeV. The upper limit on the $pp \rightarrow HH$ production cross section at 95% CL is calculated to be 10 pb from the observed upper limit on the $pp \rightarrow HH \rightarrow b\bar{b}WW^*$ production cross section of 2.5 pb assuming the SM branching fractions. The former corresponds to about 300 times the SM prediction.	NODE=S126SHH;LINKAGE=N
²⁰ AABOUD 19T search for <i>HH</i> production using $HH \rightarrow WW^*WW^*$ with data of 36.1 fb ⁻¹ at $E_{\rm cm} = 13$ TeV. The upper limit on the $pp \rightarrow HH$ production cross section at 95% is measured to be 5.3 pb, which corresponds to about 160 times the SM prediction.	NODE=S126SHH;LINKAGE=O
²¹ SIRUNYAN 19 search for <i>HH</i> production using $HH \rightarrow \gamma \gamma b \overline{b}$ with data of 35.9 fb ⁻¹ at $E_{\rm cm} = 13$ TeV. The upper limit on the $pp \rightarrow HH \rightarrow \gamma \gamma b \overline{b}$ production cross	NODE=S126SHH;LINKAGE=H

NODE=S126SHH:LINKAGE=M

NODE=S126SHH;LINKAGE=P

NODE=S126SHH;LINKAGE=L

NODE=S126SHH;LINKAGE=G

NODE=S126SHH;LINKAGE=K

NODE=S126SHH;LINKAGE=I

NODE=S126SHH;LINKAGE=B

NODE=S126SHH;LINKAGE=F

NODE=S126SHH;LINKAGE=E

NODE=S126SHH;LINKAGE=D

NODE=S126SHH;LINKAGE=A

NODE=S126SHH;LINKAGE=C

NODE=S126KLA

section at 95% CL is measured to be 2.0 fb, which corresponds to about 24 times the SM prediction.

- ²² SIRUNYAN 19AB search for *HH* production using $HH \rightarrow b\overline{b}b\overline{b}$, where 4 heavy flavor jets from two Higgs bosons are resolved, with data of 35.9 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The upper limit on the $pp \rightarrow HH \rightarrow b\overline{b}b\overline{b}$ production cross section at 95% is measured to be 847 fb, which corresponds to about 75 times the SM prediction.
- 23 SIRUNYAN 19BE combine results of 13 TeV 35.9 fb $^{-1}$ data: SIRUNYAN 19, SIRUNYAN 19AD, SIRUNYAN 19H, and SIRUNYAN 18F.
- ²⁴ SIRUNYAN 19H search for *HH* production using $HH \rightarrow b\bar{b}b\bar{b}$, where one of $b\bar{b}$ pairs is highly boosted and the other one is resolved, with data of 35.9 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The upper limit on the $pp \rightarrow HH \rightarrow b\bar{b}b\bar{b}$ production cross section at 95% is measured to be 1980 fb, which corresponds to about 179 times the SM prediction.
- ²⁵ AABOUD 18BU search for *HH* production using $\gamma\gamma W W^*$ with the final state of $\gamma\gamma\ell\nu jj$ using data of 36.1 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The upper limit on the $pp \rightarrow HH$ production cross section at 95% CL is measured to be 7.7 pb, which corresponds to about 230 times the SM prediction. The upper limit on the $pp \rightarrow HH \rightarrow \gamma\gamma WW^*$ at 95% CL is measured to be 7.5 fb (see thier Table 6).
- ²⁶ AABOUD 18CQ search for *HH* production using $HH \rightarrow b\bar{b}\tau\tau$ with data of 36.1 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The upper limit on the $pp \rightarrow HH \rightarrow b\bar{b}\tau\tau$ production cross section at 95% is measured to be 30.9 fb, which corresponds to about 12.7 times the SM prediction.
- ²⁷ AABOUD 18CW search for *HH* production using $HH \rightarrow \gamma \gamma b \overline{b}$ with data of 36.1 fb⁻¹ at $E_{\rm CM} = 13$ TeV. The upper limit on the $pp \rightarrow HH$ production cross section at 95% is measured to be 0.73 pb, which corresponds to about 22 times the SM prediction.
- ²⁸SIRUNYAN 18A search for *HH* production using $HH \rightarrow b\overline{b}\tau\tau$ with data of 35.9 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The upper limit on the $gg \rightarrow HH \rightarrow b\overline{b}\tau\tau$ production cross section is measured to be 75.4 fb, which corresponds to about 30 times the SM prediction.
- ²⁹ SIRUNYAN 18F search non-resonant for *HH* production using $HH \rightarrow b\overline{b}\ell\nu\ell\nu$, where $\ell\nu\ell\nu$ is either $WW \rightarrow \ell\nu\ell\nu$ or $ZZ \rightarrow \ell\ell\nu\nu$ (ℓ is e, μ or a leptonically decaying τ), with data of 35.9 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The upper limit on the $HH \rightarrow b\overline{b}\ell\nu\ell\nu$ production cross section at 95% CL is measured to be 72 fb, which corresponds to about 79 times the SM prediction.
- ³⁰ SIRUNYAN 17CN search for *HH* production using $HH \rightarrow b\bar{b}\tau\tau$ with data of 18.3 fb⁻¹ at $E_{\rm cm} = 8$ TeV. Results are then combined with the published results of the $HH \rightarrow \gamma\gamma b\bar{b}$ and $HH \rightarrow b\bar{b}b\bar{b}$, which use data of up to 19.7 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The upper limit on the $gg \rightarrow HH$ production cross section is measured to be 0.59 pb from $b\bar{b}\tau\tau$, which corresponds to about 59 times the SM prediction (gluon fusion). The combined upper limit is 0.43 pb, which is about 43 times the SM prediction. The quoted values are given for $m_H = 125$ GeV.
- ³¹AABOUD 16I search for *HH* production using *HH* $\rightarrow b\overline{b}b\overline{b}$ with data of 3.2 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The upper limit on the $pp \rightarrow HH \rightarrow b\overline{b}b\overline{b}$ production cross section is measured to be 1.22 pb. This result corresponds to about 108 times the SM prediction (gluon fusion), which is $11.3^{+0.9}_{-1.0}$ fb (NNLO+NNLL) including top quark mass effects. The quoted values are given for $m_H = 125$ GeV.
- ³²KHACHATRYAN 16BQ search for *HH* production using $HH \rightarrow \gamma\gamma b\bar{b}$ with data of 19.7 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The upper limit on the $gg \rightarrow HH \rightarrow \gamma\gamma b\bar{b}$ production is measured to be 1.85 fb, which corresponds to about 74 times the SM prediction and is translated into 0.71 pb for $gg \rightarrow HH$ production cross section.
- ³³ AAD 15CE search for *HH* production using $HH \rightarrow b\bar{b}\tau\tau$ and $HH \rightarrow \gamma\gamma WW$ with data of 20.3 fb⁻¹ at $E_{\rm cm} = 8$ TeV. These results are then combined with the published results of the $HH \rightarrow \gamma\gamma b\bar{b}$ and $HH \rightarrow b\bar{b}b\bar{b}$, which use data of up to 20.3 fb⁻¹ at $E_{\rm cm} = 8$ TeV. The upper limits on the $gg \rightarrow HH$ production cross section are measured to be 1.6 pb, 11.4 pb, 2.2 pb and 0.62 pb from $b\bar{b}\tau\tau$, $\gamma\gamma WW$, $\gamma\gamma b\bar{b}$ and $b\bar{b}b\bar{b}$, respectively. The combined upper limit is 0.69 pb, which corresponds to about 70 times the SM prediction. The quoted results are given for $m_H = 125.4$ GeV. See their Table 4.

Higgs trilinear self coupling modifier κ_{λ}

Signal strer	ngth relat	ive to the SM pred	diction, $\kappa_\lambda =$	$\lambda_{HHH} / \lambda_{HHH}^{SM}$	NODE=S126KLA
VALUE	<u>CL%</u>	DOCUMENT ID	TECN	COMMENT	NODE=S126KLA
$\bullet \bullet \bullet$ We do not	use the f	following data for a	averages, fits,	limits, etc. • • •	
-34.4 to 33.3	95	¹ AAD	23AD ATLS	13 TeV, VHH , $HH \rightarrow b\overline{b}b\overline{b}$	
- 0.6 to 6.6	95	² AAD	23AT ATLS	13 TeV, $b\overline{b}b\overline{b}$, $b\overline{b}\tau\tau$, $b\overline{b}\gamma\gamma$	
- 0.4 to 6.3	95	³ AAD	23AT ATLS	13 TeV, $b\overline{b}b\overline{b}$, $b\overline{b}\tau\tau$, $b\overline{b}\gamma\gamma$	OCCUR=2
- 3.5 to 11.3	95	⁴ AAD	23BK ATLS	13 TeV, bbbb	
- 5.4 to 14.9	95	⁵ HAYRAPETY	23 CMS	13 TeV, $ZZ^* ightarrow 4\ell$ cross	
		C		sections	-
- 9.9 to 16.9	95	⁶ TUMASYAN	23AE CMS	13 TeV, <i>bbbb</i>	
- 1.7 to 8.7	95	⁷ TUMASYAN	23D CMS	13 TeV, $b \overline{b} \tau \tau$	
- 8.8 to 13.4	95	⁸ TUMASYAN	23I CMS	13 TeV, $b\overline{b}ZZ^*$ ($ZZ^* ightarrow$	
				4ℓ)	

- 6.9	to 11.1	95	⁹ TUMASYAN	230 CMS	13 TeV, <i>WW</i> * <i>WW</i> *,	
- 1.5	to 6 7	95	¹⁰ AAD	22Y ATLS	$WW^* \tau \tau, \tau \tau \tau \tau$ 13 TeV, $\gamma \gamma b \overline{b}$	
	to 6.49	95	¹¹ CMS	221 MILS	13 TeV, $b\overline{b}ZZ^*$, $b\overline{b}\gamma\gamma$,	
	10 01 15	50	00		$b\overline{b}\tau\tau$, $b\overline{b}b\overline{b}$, multilepton	
- 2.3	to 9.4	95	¹² TUMASYAN	22AN CMS	13 TeV, $b\overline{b}b\overline{b}$	
- 3.3	to 8.5	95	¹³ SIRUNYAN	21K CMS	13 TeV, $\gamma \gamma b \overline{b}$	
- 5.0	to 12.0	95	¹⁴ AAD	20C ATLS	13 TeV, $b\overline{b}\gamma\gamma$, $b\overline{b}\tau\tau$, $b\overline{b}b\overline{b}$,	
					$b\overline{b}WW^*$, $WW^*\gamma\gamma$,	
			15 00000000		WW^*WW^*	
-11	to 17	95	¹⁵ SIRUNYAN	19 CMS	13 TeV, $\gamma \gamma b b$	
-11.8	to 18.8	95	¹⁶ SIRUNYAN	19BE CMS	13 TeV, $bb\gamma\gamma$ $bb\tau\tau$, $bbbb$,	
0 1	+0 12 2	05	¹⁷ AABOUD	18cwATLS	$b\overline{b}WW^*$, $b\overline{b}ZZ^*$ 13 TeV, $\gamma\gamma b\overline{b}$	
- 0.2	to 13.2	95	¹⁸ SIRUNYAN	18CWATES	13 TeV, $b\overline{b}\tau\tau$	
_17	to 22.5	95	¹⁹ KHACHATRY.		8 TeV, $\gamma \gamma b \overline{b}$	
					. , ,	
¹ AA	D 23AD sea	arch for	non-resonant HH	production in	association with a vector boson	NODE=S126KLA;LINKAGE=F
usir	$\operatorname{Hg} HH \to$	bbbbw	ith data of 139 fb ⁻	$^{-}$ at $E_{cm} = 1$.3 TeV. The vector boson decays quoted κ_λ is measured assuming	
lept	onically (<i>V</i>	$V \rightarrow \ell \nu$	$\ell, Z \rightarrow \ell \ell, \nu \nu, \ell =$	e, μ). The c	quoted κ_λ is measured assuming	
					$a \rightarrow E = 12 \text{ TeV} (far a - 1)$	
					a at $E_{\rm cm} = 13$ TeV for $pp \rightarrow \frac{1}{2}$	NODE=S126KLA;LINKAGE=M
	$i \rightarrow DDD$	b (AAD	23BK), $DD\tau\tau$ (AA m the profile likelih	D 232, and	$b\overline{b}\gamma\gamma$ (AAD 22Y). The quoted function of κ_{λ} as shown in their	
Fig	5(a) All	other co	unling modifiers are	assumed to l	have their SM values.	
					a at $E_{ m cm}=$ 13 TeV for $pp ightarrow$	
					$\gamma \gamma$ (AAD 22Y) with single-Higgs	NODE=S126KLA;LINKAGE=N
					Table 1). The quoted values are function of the state of the sta	
					f κ_{λ} as shown in their Fig. 5(a), ir SM values. Results with other	
			in their Table 2.		in Sim values. Results with other	
				production usi	ng $HH ightarrow b \overline{b} b \overline{b}$ with data of	NODE=S126KLA;LINKAGE=L
					tained from the one-dimensional	
prot	file likeliho	od scan	as a function of κ	λ . See their	Fig. 12 (a). The $\mu_{qqF+VBF}$	
					$0 < \kappa_{\lambda} < 11.1$ at 95% CL as	
sho	wn in their	Fig. 10	(a). $\kappa_{2V} = \kappa_V \stackrel{\wedge}{=} 1$	is assumed in	both cases.	
					$ ightarrow ~H ightarrow ~Z Z^* ightarrow ~4\ell~ (\ell = e,$	NODE=S126KLA;LINKAGE=O
			$E_{\rm cm} = 13$ TeV.			NODE-SIZONEA, EINNAGE-O
				ion using HH	$\rightarrow b\overline{b}b\overline{b}$, where both $b\overline{b}$ pairs	
are	highly boos	sted with	h data of 138 fb $^{-1}$	at $F = 13^{\circ}$	TeV. The quoted κ_{λ} is measured	NODE=S126KLA;LINKAGE=G
assi	uming all o	ther Hig	gs boson couplings	are at their S	M values.	
					on using $HH ightarrow b \overline{b} au au$ with data	NODE=S126KLA;LINKAGE=J
					obtained from the upper limit on	NODE-SIZOREA,EINRAGE-J
+ho		ction cro	ss section times th	$e^{b}\overline{b}\pi\pi$ brance	thing fraction for different values	
					difiers are assumed to be 1. In	
					on of the κ_{λ} and κ_{t} couplings,	
					The one-dimensional likelihood	
scar	n as a func	tion of	κ_λ is given in their	r Fig 10 (left)	, from which a 95% confidence	
			< 8.73 is extracte			
					uction using $HH \rightarrow b\overline{b}ZZ^*$	NODE=S126KLA;LINKAGE=E
					13 TeV. See their Fig. 4.	
⁹ TU	MASYAN 2	230 searc	ch for non-resonant	HH producti	on using $HH \rightarrow WW^*WW^*$,	NODE=S126KLA;LINKAGE=K
WI	$W^* \tau \tau$, and	$1 \tau \tau \tau \tau$	(multilepton) with a	data of 138 fb	$^{-1}$ at $E_{\rm cm} = 13$ TeV. See their	
Fig.	. 10 for di	fferent fi	nal states and thes	e combinatior	n. Limits are set on a variety of	
	<i>i</i> -physics m	odels us	ing an effective field	d theory appro	oach. See their Figs. 11, 12, and	
13. 10 A A	D 00V					
AA	D 22Y sear	cn for n	on-resonant HH p	roduction usi	$hg HH \rightarrow \gamma \gamma b \overline{b} \text{ with data of}$	NODE=S126KLA;LINKAGE=V
139 tho	TD - at E	$c_{\rm cm} = 1$.3 IeV. The quoted	κ_{λ} is obtain	ed from their Fig. 12 where the g-likelihood scan vs. κ_{λ} is shown	
			ne theory uncertain	ties, which pro	ovides $\kappa_\lambda = 2.8 {+2.0 \atop -2.2}$ for the 1σ	
con	fidence inte	erval.		. Catandad D	$T_{\rm rel} = 1.20 {\rm gm}^{-1}$	
dat:	5 22 repor	t combir – 13 Tal	/. See their Fig. 6	(left)	Pata Table 2) using 138 fb $^{-1}$ of	NODE=S126KLA;LINKAGE=U
					\overline{L}	
10	IVIASTAN	-1 .		n n n produ	ction using $HH \rightarrow b\overline{b}b\overline{b}$ with	NODE=S126KLA;LINKAGE=W
data	a UI 130 ft	, at E	$c_{\rm cm} = 13$ (ev. 1)	ie upper limit	on the $pp \rightarrow HH$ production n their Fig. 2 (top).	
13 010					$\frac{1}{2} \left(\frac{1}{2} \right) = \frac{1}{2} \left(\frac{1}{2} \right) = \frac{1}$	
SIR	UNTAN 21	.r. search + E	1 101 1101-resonant F	production	h using $HH ightarrow \gamma \gamma b \overline{b}$ with data	NODE=S126KLA;LINKAGE=T
	137 fb $^{-1}$ a			. a _1 .		
					at $E_{\rm cm}$ = 13 TeV for pp $ ightarrow$	NODE=S126KLA;LINKAGE=Q
					W W* W W* (AABOUD 18cw,	
AA	ROOD 180	Q, AABO	JUD 19A, AABOUI	J 190, AABO	UD 18BU, and AABOUD 19T).	

- ¹⁵ SIRUNYAN 19 search for *HH* production using $HH \rightarrow \gamma \gamma b \overline{b}$ with data of 35.9 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The quoted κ_{λ} is measured assuming all other Higgs boson couplings are at their SM value.
- 16 SIRUNYAN 19BE combine results of 13 TeV 35.9 fb $^{-1}$ data: SIRUNYAN 19, SIRUNYAN 19AN 18A, SIRUNYAN 19AB, SIRUNYAN 19H, and SIRUNYAN 18F.
- ¹⁷ AABOUD 18CW search for *HH* production using *HH* $\rightarrow \gamma\gamma b\overline{b}$ with data of 36.1 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The quoted κ_{λ} is measured assuming all other Higgs boson couplings are at their SM value.
- ¹⁸ SIRUNYAN 18A search for *HH* production using $HH \rightarrow b\bar{b}\tau\tau$ with data of 35.9 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The upper limit on production cross section times branching fraction at 95% CL is shown as a function of $\kappa_{\lambda}/\kappa_t$ in their Fig. 6 (top) where $\kappa_t = y_t / y_t^{SM}$ (top Yukawa coupling y_t).
- ¹⁹ KHACHATRYAN 16BQ search for *HH* production using $HH \rightarrow \gamma \gamma b \overline{b}$ with data of 19.7 fb⁻¹ at $E_{\rm cm} = 8$ TeV.

Higgs-gauge boson quartic coupling modifier κ_{2V}

Signal stre <i>W</i> , <i>Z</i> .	ngth rela	ative to the SM p	prediction, κ_{2V}	$= \lambda_{VVHH} / \lambda_{VVHH}^{SM}, V =$	=
VALUE	<u>CL%</u>	DOCUMENT II	D <u>TECN</u>	COMMENT	_
• • • We do not	use the	following data for	r averages, fits,	imits, etc. • • •	
-8.6 to 10.0	95	¹ AAD	23AD ATLS	13 TeV, VHH, HH $\rightarrow b\overline{b}b$	Б

-8.0 to 10.0	95	- AAD	23AD AT LS	13 lev, $V \Pi \Pi$, $\Pi \Pi \rightarrow D D D D$
0.1 to 2.0	95	² AAD	23AT ATLS	13 TeV, $b\overline{b}b\overline{b}$, $b\overline{b}\tau\tau$, $b\overline{b}\gamma\gamma$
0.0 to 2.1	95	³ AAD	23BK ATLS	13 TeV, <i>bbbb</i>
0.62 to 1.41	95	⁴ TUMASYAN		13 TeV, <i>bbbb</i>
-0.4 to 2.6	95	⁵ TUMASYAN	23D CMS	13 TeV, $b\overline{b} au au$
0.67 to 1.38	95	⁶ CMS	22 CMS	13 TeV, $b\overline{b}ZZ^*$, $b\overline{b}\gamma\gamma$,
		_		$b\overline{b}\tau\tau$, $b\overline{b}b\overline{b}$, multilepton
-0.1 to 2.2	95	⁷ TUMASYAN		13 TeV, <i>bbbb</i>
-1.3 to 3.5	95	⁸ SIRUNYAN	21K CMS	13 TeV, $\gamma \gamma b \overline{b}$
-0.43 to 2.56	95	⁹ AAD	20X ATLS	13 TeV, VBF, $b\overline{b}b\overline{b}$

- ¹ AAD 23AD search for non-resonant *HH* production in association with a vector boson using $HH \rightarrow b\bar{b}b\bar{b}$ with data of 139 fb⁻¹ at $E_{cm} = 13$ TeV. The vector boson decays leptonically ($W \rightarrow \ell\nu, Z \rightarrow \ell\ell, \nu\nu, \ell = e, \mu$). The constraints on κ_{2W} and κ_{2Z} are separately measured to be -12.3 < κ_{2W} < 13.5 and -9.9 < κ_{2Z} < 11.3 (95% CL). The quoted κ_{2V} (V = W, Z) is measured assuming all other Higgs boson couplings are at their SM value.
- ² AAD 23AT combine results from 126–139 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV for $pp \rightarrow HH \rightarrow b\bar{b}b\bar{b}$ (AAD 23BK), $b\bar{b}\tau\tau$ (AAD 23Z), and $b\bar{b}\gamma\gamma$ (AAD 22Y). The quoted values are obtained from the 95% CL VBF *HH* cross-section upper limit as a function of κ_{2V} as shown in their Fig. 4(b). All other coupling modifiers are assumed to have their SM values.
- ³ AAD 23BK search for non-resonant *HH* production using *HH* $\rightarrow b\bar{b}b\bar{b}$ with data of 126 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The quoted values are obtained from the one-dimensional profile likelihood scan as a function of κ_{2V} . See their Fig. 12 (b). The μ_{VBF} measurement for different values of κ_{2V} constrains -0.03 < $\kappa_{2V} < 2.11$ at 95% CL as shown in their Fig. 10 (b). $\kappa_{\lambda} = \kappa_{V} = 1$ is assumed in both cases.
- ⁴TUMASYAN 23AE search for *HH* production using $HH \rightarrow b\overline{b}b\overline{b}$, where both $b\overline{b}$ pairs are highly boosted, with data of 138 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The $\kappa_{2V} = 0$ is excluded _ at 6.3 σ assuming all other Higgs boson couplings are at their SM values.
- ⁵TUMASYAN 23D search for non-resonant *HH* production using $HH \rightarrow b\bar{b}\tau\tau$ with data of 138 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The quoted values are obtained from the upper limits on the *HH* production cross section times the $b\bar{b}\tau\tau$ branching fraction for different values of κ_{2V} . See their Fig. 8 (right). All other coupling modifiers are assumed to be 1. In addition, two-dimensional exclusion regions as a function of the κ_{2V} and κ_V couplings, with $\kappa_{\lambda} = \kappa_t = 1$, are shown in their Fig. 9 (right). The one-dimensional likelihood scan as a function of κ_{2V} is given in their Fig. 10 (right), from which a 95% confidence interval of -0.34 < $\kappa_{2V} < 2.49$ is extracted.
- ⁶ CMS 22 report combined results (see their Extended Data Table 2) using 138 fb⁻¹ of data at $E_{\rm cm} = 13$ TeV. See their Fig. 6 (right).
- ⁷ TUMASYAN 22AN search for non-resonant *HH* production using $HH \rightarrow b\overline{b}b\overline{b}$ with data of 138 fb⁻¹ at $E_{\rm cm} = 13$ TeV. The upper limit on the $pp \rightarrow HH$ production cross section at 95% CL is shown as a function of κ_{2V} in their Fig. 2 (bottom).
- ⁸SIRUNYAN 21K search for non-resonant *HH* production using $HH \rightarrow \gamma \gamma b \overline{b}$ with data of 137 fb⁻¹ at $E_{\rm cm} = 13$ TeV.
- ⁹AAD 20X search for $HH \rightarrow b\bar{b}b\bar{b}$ process via VBF with data of 126 fb⁻¹ at $E_{cm} =$ NODE=S126K2V;LINKAGE=F 13 TeV.

NODE=S126KLA;LINKAGE=H

NODE=S126KLA;LINKAGE=P

NODE=S126KLA;LINKAGE=I

NODE=S126KLA;LINKAGE=C

NODE=S126KLA;LINKAGE=D

NODE=S126K2V;LINKAGE=H

NODE=S126K2V;LINKAGE=L

NODE=S126K2V;LINKAGE=K

NODE=S126K2V;LINKAGE=I

NODE=S126K2V:LINKAGE=J

NODE=S126K2V;LINKAGE=G

NODE=S126K2V;LINKAGE=A

NODE=S126K2V;LINKAGE=E

NODE=S126K2V NODE=S126K2V NODE=S126K2V

NODE=S126A02;LINKAGE=E

NODE=S126A02;LINKAGE=D

NODE=S126A02;LINKAGE=A

NODE=S126A02;LINKAGE=B

tH production				NODE=S126PTH
VALUE	<u>DOCUMEN</u>			NODE=S126PTH
$5.7 \pm 2.7 \pm 3.0$	¹ SIRUNY/		111	
• • We do not use the	- <u>-</u>			
	² AAD ³ SIRUNYA	20z ATL	111	
		AN 19вк СМ: ATRY16au СМ:		
decaying $ au$ leptons (I	$\mathcal{H} ightarrow \mathcal{W} \mathcal{W}^*, \ Z Z^*,$ quoted signal strength	au au) with 137 to corresponds to	ons, muons and hadronically fb^{-1} of pp collision data at a significance of 1.4 standard	NODE=S126PTH;LINKAGE=D
² AAD 20Z search for t at $E_{cm} = 13$ TeV. A at 95% CL ($m_H = 1$	he <i>tH</i> associated pro n upper limit on its r 25.09 GeV).	duction using <i>H</i> ate is set to be 1	$\rightarrow \gamma \gamma$ in 139 fb ⁻¹ of data 22 times the Standard Model	NODE=S126PTH;LINKAGE=C
³ SIRUNYAN 19BK sea	rch for the <i>tH</i> associ	ated production	using multilepton signatures	NODE=S126PTH;LINKAGE=B
$(H \rightarrow WW^*, H \rightarrow$	\cdot $ au au$, $H o$ ZZ^{*}) a	nd signatures w	ith a single lepton and a $b\overline{b}$	
pair $(H \rightarrow b\overline{b})$ usin	g 35.9 fb $^{-1}$ at $E_{\rm cm}$	= 13 TeV. Resu	Its are combined with $H \rightarrow$ on the tH production cross	
			γ branching fraction is 1.94 r Table X and Fig. 14. The	
values outside the rai	nges of $[-0.9, -0.5]$	and [1.0, 2.1] ti	mes the standard model top	
quark Yukawa couplir	ng are excluded at 95	% CL.		
⁴ KHACHATRYAN 164	AU search for the tH	associated prod	uction in 19.7 fb $^{-1}$ at $E_{\rm cm}$ d production cross section is	NODE=S126PTH;LINKAGE=A
			branching ratios of the Higgs	
			r of 0.5–3.0 of the Standard	
Model Higgs boson ($m_H = 125 \text{ GeV}$). The	e results of the si	gnal strengths for a negative	
Higgs-boson trilinear	coupling are given. I	he results are given	ven for $m_{H} = 125$ GeV.	
H Production Cross S	Section in <i>pp</i> Colli	sions at $\sqrt{s} =$: 13 TeV	NODE=S126A02
Assumes $m_H = 12$				NODE=S126A02
VALUE (pb)	DOCUMENT ID	TECN	COMMENT	NODE=S126A02
56.8± 3.4 OUR AVERA				NEW
$[56.9 \pm 3.4 \text{ pb OUR } 2023]$				1
55.5^+ $\frac{4.0}{3.8}$	¹ AAD	23C ATLS	$pp, 13 \text{ TeV}, \gamma\gamma, ZZ^* \rightarrow$	1
$61.1\pm~6.0\pm3.7$	² SIRUNYAN	19BA CMS	4 ℓ ($\ell = e, \mu$) pp, 13 TeV, $\gamma\gamma$, $ZZ^* \rightarrow$	
			$4\ell~(\ell=e,~\mu)$	
• • • We do not use the		erages, fits, limit	s, etc. ● ● ●	
$58 \pm 4 \pm 4$	³ AAD		<i>pp</i> , 13 TeV, γγ	
$53.5\pm 4.9\pm 2.1$	⁴ AAD	20BA ATLS	$pp, 13 \text{ TeV}, ZZ^* \rightarrow 4\ell \ (\ell = e, \mu)$	
57.0^+ $\begin{array}{c} 6.0+4.0\\ 5.9-3.3\end{array}$	⁵ AABOUD	18cg ATLS	$p_{\mu} = e, \mu_{\mu}$ $p_{\mu} = 13 \text{ TeV}, \gamma\gamma, ZZ^* \rightarrow 4\ell \ (\ell = e, \mu)$	
47.9^+ 9.1 - 8.6	⁵ AABOUD		pp, 13 TeV, $\gamma\gamma$	OCCUR=2
$68 \begin{array}{c} +11 \\ -10 \end{array}$	⁵ AABOUD	18cg ATLS	$pp, 13 \text{ TeV}, ZZ^* \rightarrow 4\ell \ (\ell = e, \ \mu)$	OCCUR=3
$69 \ +10 \ -9 \ \pm 5$	⁶ AABOUD	17co ATLS	<i>pp</i> , 13 TeV, $ZZ^* \rightarrow 4\ell$	
at $E_{\rm cm}=13$ TeV. obtained to be 34^{+1}_{-1}	The Higgs productior ¹ pb and 33.3 ^{+5.8} p ^{5.4} p The differential cross	n cross sections a b, respectively. sections are given	se 139 fb ⁻¹ of pp collisions at $E_{cm} = 7$ and 8 TeV are The quoted value is given for n in their Figs. 3 and 4. = 13 TeV.	NODE=S126A02;LINKAGE=F NODE=S126A02;LINKAGE=C
			/. The quoted value is given	

³AAD 22N use 139 fb⁻¹ of pp collisions at $E_{\rm cm} = 13$ TeV. The quoted value is given for $m_{\rm H} = 125.09$ GeV.

⁴ AAD 20BA use 139 fb⁻¹ of pp collisions at $E_{cm} = 13$ TeV with $H \rightarrow ZZ^* \rightarrow 4\ell$ where $\ell = e, \mu$. The quoted value is given for $m_H = 125$ GeV and assumes the Standard Model branching ratio. ⁵ AABOUD 18CG use 36.1 fb⁻¹ of pp collisions at $E_{cm} = 13$ TeV.

⁶AABOUD 17C0 use 36.1 fb⁻¹ of *pp* collisions at $E_{cm} = 13$ TeV with $H \rightarrow ZZ^* \rightarrow 4\ell$ where $\ell = e$, μ for $m_H = 125$ GeV. Differential cross sections for the Higgs boson transverse momentum, Higgs boson rapidity, and other related quantities are measured as shown in their Figs. 8 and 9.

H REFERENCES

AABOUD 23A JHP 2321 138 (errst.) M. Asboud er al. (ATLAS Collab.) AAD 23A PF 1023 503 C. Aud er al. (ATLAS Collab.) AAD 23AF EP1 CB3 503 C. Aud er al. (ATLAS Collab.) AAD 23AF EP1 CB3 503 C. Aud er al. (ATLAS Collab.) AAD 23AF EP1 CB3 503 C. Aud er al. (ATLAS Collab.) AAD 23AF EP1 CB3 503 C. Aud er al. (ATLAS Collab.) AAD 23AF EP1 CB3 502005 C. Aud er al. (ATLAS Collab.) AAD 23BF PL B843 137880 C. Aud er al. (ATLAS Collab.) AAD 23BF PL B847 138223 C. Aud er al. (ATLAS Collab.) AAD 23BF PL B847 138232 C. Aud er al. (ATLAS Collab.) AAD 23BF PL B847 138232 C. Aud er al. (ATLAS Collab.) AAD 23BF PL B847 138232 C. Aud er al. (ATLAS Collab.) AAD 23BF PL B847 138232 C. Aud er al. (ATLAS Collab.) AAD 23D PLP 2307 166 C. Aud er al. (ATLAS Collab.) AAD 2	AAD	24D PRL 132 021803	G. Aad <i>et al.</i>	(ATLAS and CMS Collabs.)
AAD 23AF EPJ C83 503 G. Aad et al. (ATLAS Collab) AAD 23AN PRL 131 061802 G. Aad et al. (ATLAS Collab) AAD 23AP PR D108 032005 G. Aad et al. (ATLAS Collab) AAD 23AP PR D108 032005 G. Aad et al. (ATLAS Collab) AAD 23AP PL B843 137745 G. Aad et al. (ATLAS Collab) AAD 23AU PL B843 137880 G. Aad et al. (ATLAS Collab) AAD 23BC EPJ C83 4966 G. Aad et al. (ATLAS Collab) AAD 23BF PRL D180 052003 G. Aad et al. (ATLAS Collab) AAD 23BF PRL 131 251002 G. Aad et al. (ATLAS Collab) AAD 23BF PRL 131 251002 G. Aad et al. (ATLAS Collab) AAD 23BF PRL 131 85102 G. Aad et al. (ATLAS Collab) AAD 23BF PRL 191 83613 G. Aad et al. (ATLAS Collab) AAD 23BF PRL 191 803102 G. Aad et al. (ATLAS Collab) AAD 23C JHEP 2307 166 G. Aad et al. (ATLAS Collab) AAD 232	AABOUD AAD	23A PL B842 137963		
AAD 23AU PL B343 13/880 G. Aad et al. (ATLAS Collab.) AAD 23BK PR D108 052003 G. Aad et al. (ATLAS Collab.) AAD 23BF PL B346 138223 G. Aad et al. (ATLAS Collab.) AAD 23BF PL B346 138292 G. Aad et al. (ATLAS Collab.) AAD 23BF PL B347 138315 G. Aad et al. (ATLAS Collab.) AAD 23BV PR D180 072003 G. Aad et al. (ATLAS Collab.) AAD 23C JHEP 2307 028 G. Aad et al. (ATLAS Collab.) AAD 23Q JHEP 2307 166 G. Aad et al. (ATLAS Collab.) AAD 23Q JHEP 2307 088 G. Aad et al. (ATLAS Collab.) AAD 23Q JHEP 2307 080 G. Aad et al. (CMS Collab.) HAYRAPETY		234F EPI (83 503	G And et al	
AAD 23AU PL B343 13/880 G. Aad et al. (ATLAS Collab.) AAD 23BK PR D108 052003 G. Aad et al. (ATLAS Collab.) AAD 23BF PL B346 138223 G. Aad et al. (ATLAS Collab.) AAD 23BF PL B346 138292 G. Aad et al. (ATLAS Collab.) AAD 23BF PL B347 138315 G. Aad et al. (ATLAS Collab.) AAD 23BV PR D180 072003 G. Aad et al. (ATLAS Collab.) AAD 23C JHEP 2307 028 G. Aad et al. (ATLAS Collab.) AAD 23Q JHEP 2307 166 G. Aad et al. (ATLAS Collab.) AAD 23Q JHEP 2307 088 G. Aad et al. (ATLAS Collab.) AAD 23Q JHEP 2307 080 G. Aad et al. (CMS Collab.) HAYRAPETY		23AK EPJ C83 563 23AN PRI 131 061802	G. Aad <i>et al.</i> G. Aad <i>et al</i>	
AAD 23AU PL B343 13/880 G. Aad et al. (ATLAS Collab.) AAD 23BK PR D108 052003 G. Aad et al. (ATLAS Collab.) AAD 23BF PL B346 138223 G. Aad et al. (ATLAS Collab.) AAD 23BF PL B346 138292 G. Aad et al. (ATLAS Collab.) AAD 23BF PL B347 138315 G. Aad et al. (ATLAS Collab.) AAD 23BV PR D180 072003 G. Aad et al. (ATLAS Collab.) AAD 23C JHEP 2307 028 G. Aad et al. (ATLAS Collab.) AAD 23Q JHEP 2307 166 G. Aad et al. (ATLAS Collab.) AAD 23Q JHEP 2307 088 G. Aad et al. (ATLAS Collab.) AAD 23Q JHEP 2307 080 G. Aad et al. (CMS Collab.) HAYRAPETY	AAD	23AP PR D108 032005	G. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 238K PR D108 052003 G. Aad et al. (ATLAS Collab.) AAD 238P PL B46 136223 G. Aad et al. (ATLAS Collab.) AAD 238S PL B47 138215 G. Aad et al. (ATLAS Collab.) AAD 238U PR D180 072003 G. Aad et al. (ATLAS Collab.) AAD 238U PR D108 072003 G. Aad et al. (ATLAS Collab.) AAD 23C DEPJ C83 781 G. Aad et al. (ATLAS Collab.) AAD 23C JHEP 2307 166 G. Aad et al. (ATLAS Collab.) AAD 23Q JHEP 2307 166 G. Aad et al. (ATLAS Collab.) AAD 23Q JHEP 2307 166 G. Aad et al. (ATLAS Collab.) AAD 23Z JHEP 2307 040 G. Aad et al. (ATLAS Collab.) HAYRAPETY	AAD	23AU PL B843 137880	G. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 23BR PL B846 138223 G. Aad et al. (ATLAS Collab.) AAD 23BV PL B847 138315 G. Aad et al. (ATLAS Collab.) AAD 23BV PR D108 072003 G. Aad et al. (ATLAS Collab.) AAD 23BV PR D108 072003 G. Aad et al. (ATLAS Collab.) AAD 23C DEPJ C83 781 G. Aad et al. (ATLAS Collab.) AAD 23C DEPJ C83 781 G. Aad et al. (ATLAS Collab.) AAD 23Q JHEP 2307 166 G. Aad et al. (ATLAS Collab.) AAD 23Y JHEP 2307 040 G. Aad et al. (ATLAS Collab.) AAD 23Z JHEP 2308 040 A. Hayrapetyan et al. (CMS Collab.) TUMASYAN 23AE PRL 131 041801 A. Tumasyan et al. (CMS Collab.) TUMASYAN 23AE PRL 131 041801 A. Tumasyan et al. (CMS Collab.) TUMASYAN 23AL PR D108 032003 A. Tumasyan et al. (CMS Collab.) TUMASYAN 23AL PR D108 032013 A. Tumasyan et al. (CMS Collab.) TUMASYAN 23AL PR D180 032013 A. Tumasyan et al. (CMS Collab.) TUMASYAN			G. Aad <i>et al.</i>	
AAD 23BS PL B847 138292 G. Aad et al. (ATLAS Collab.) AAD 23BU PL B847 138315 G. Aad et al. (ATLAS Collab.) AAD 23C JHEP 2305 028 G. Aad et al. (ATLAS Collab.) AAD 23C JHEP 2307 166 G. Aad et al. (ATLAS Collab.) AAD 23Q JHEP 2307 088 G. Aad et al. (ATLAS Collab.) AAD 23Z JHEP 2307 088 G. Aad et al. (ATLAS Collab.) AAD 23Z JHEP 2307 080 G. Aad et al. (ATLAS Collab.) AAD 23Z JHEP 2307 080 G. Aad et al. (CMS Collab.) HAYRAPETY 23C PR D108<072004				
AAD 23BV PR D108 072003 G. Aad et al. (ATLAS Collab.) AAD 23C JHEP 2305 028 G. Aad et al. (ATLAS Collab.) AAD 23C EPJ C83 781 G. Aad et al. (ATLAS Collab.) AAD 23Q JHEP 2307 068 G. Aad et al. (ATLAS Collab.) AAD 23Z JHEP 2307 0708 G. Aad et al. (ATLAS Collab.) HAYRAPETY 23 JHEP 2308 040 A. Hayrapetyan et al. (CMS Collab.) HAYRAPETY 23C PR D108 072004 A. Hayrapetyan et al. (CMS Collab.) TUMASYAN 23AD PR 1131 041801 A. Tumasyan et al. (CMS Collab.) TUMASYAN 23AL PR D108 032008 A. Tumasyan et al. (CMS Collab.) TUMASYAN 23AJ PR D108 032013 A. Tumasyan et al. (CMS Collab.) TUMASYAN 23AL PL B842 137531 A. Tumasyan et al. (CMS Collab.) TUMASYAN 23BL PL B842 137531 A. Tumasyan et al. (CMS Collab.) TUMASYAN 23B JHEP 2307 092		23BS PL B847 138292	G. Aad <i>et al.</i>	
AAD 23CD EPJ C83 781 G. Aad et al. (ATLAS Collab.) AAD 23Y JHEP 2307 166 G. Aad et al. (ATLAS Collab.) AAD 23Z JHEP 2307 088 G. Aad et al. (ATLAS Collab.) AAD 23Z JHEP 2308 040 A. Hayrapetyan et al. (CMS Collab.) HAYRAPETY 23 JHEP 2080 040 A. Hayrapetyan et al. (CMS Collab.) TUMASYAN 23AD PR L131 041801 A. Tumasyan et al. (CMS Collab.) TUMASYAN 23AP PR L131 041801 A. Tumasyan et al. (CMS Collab.) TUMASYAN 23AJ PR D108 032008 A. Tumasyan et al. (CMS Collab.) TUMASYAN 23AJ PR D108 032013 A. Tumasyan et al. (CMS Collab.) TUMASYAN 23AJ PL B842 137534 A. Tumasyan et al. (CMS Collab.) TUMASYAN 23C PL B842 137534 A. Tumasyan et al. (CMS Collab.) TUMASYAN 23C PL B842 137534 A. Tumasyan et al. (CMS Collab.) TUMASYAN 23C PL B842 137534 <td>AAD</td> <td>23BV PR D108 072003</td> <td>G. Aad <i>et al.</i></td> <td>(ATLAS Collab.)</td>	AAD	23BV PR D108 072003	G. Aad <i>et al.</i>	(ATLAS Collab.)
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SIRUNYAN	20L PL B805 135425	A.M. Sirunyan et al.	(CMS Collab.)
AABOUD	19A JHEP 1901 030	M. Aaboud et al.	(ATLAS Collab.)
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AABOUD	19AL PRL 122 231801	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	19AQ PR D99 072001	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	19F PL B789 508	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	19N JHEP 1904 048	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	190 JHEP 1904 092	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	19T JHEP 1905 124	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	19U JHEP 1905 141	M. Aaboud et al.	(ATLAS Collab.)
AAD	19A PL B798 134949	G. Aad et al.	(ATLAS Collab.)
SIRUNYAN	19 PL B788 7	A.M. Sirunyan et al.	(CMS Collab.)
SIRUNYAN	19AB JHEP 1904 112	A.M. Sirunyan <i>et al.</i>	(CMS Collab.)
SIRUNYAN	19AF JHEP 1906 093	A.M. Sirunyan et al.	(CMS Collab.)
SIRUNYAN	19AJ EPJ C79 94	A.M. Sirunyan <i>et al.</i>	(CMS Collab.)
SIRUNYAN	19AT EPJ C79 421	A.M. Sirunyan et al.	(CMS Collab.)
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SIRUNYAN	19BE PRL 122 121803	A.M. Sirunyan <i>et al.</i>	(CMS Collab.)
SIRUNYAN	19BK PR D99 092005	A.M. Sirunyan et al.	(CMS Collab.)
SIRUNYAN	19BL PR D99 112003	A.M. Sirunyan et al.	(CMS Collab.)
SIRUNYAN	19BO PL B793 520	A.M. Sirunyan <i>et al.</i>	(CMS Collab.)
SIRUNYAN	19BR PL B797 134811	A.M. Sirunyan <i>et al.</i>	(CMS Collab.)
SIRUNYAN	19BY PR D100 072007	A.M. Sirunyan <i>et al.</i>	(CMS Collab.)
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AABOUD	18 PL B776 318	M. Aaboud <i>et al.</i>	(ATLAS Collab.)
AABOUD	18AC PR D97 072003	M. Aaboud <i>et al.</i>	(ATLAS Collab.)
AABOUD	18AJ JHEP 1803 095	M. Aaboud <i>et al.</i>	(ATLAS Collab.)
AABOUD	18AU JHEP 1807 127	M. Aaboud <i>et al.</i>	(ATLAS Collab.)
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AABOUD	18BL PL B786 134	M. Aaboud <i>et al.</i>	(ATLAS Collab.)
AABOUD	18BM PL B784 345	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	18BN PL B786 59	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	18BO PR D98 052005	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	18BP PL B786 223	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	18BQ PR D98 052003	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	18BU EPJ C78 1007	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	18CA JHEP 1810 180	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	18CG PL B786 114	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	18CQ PRL 121 191801	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	18CW JHEP 1811 040	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	18M PRL 120 211802	M. Aaboud et al.	(ATLAS Collab.)
AABOUD	18T PR D97 072016	M. Aaboud <i>et al.</i>	(ATLAS Collab.)
AAIJ	18AM EPJ C78 1008	R. Aaij <i>et al.</i>	(LHCb Collab.)
AALTONEN	18C PR D98 072002	T. Aaltonen <i>et al.</i>	(CDF Collab.)
SIRUNYAN	18A PL B778 101	A.M. Sirunyan et al.	(CMS Collab.)
SIRUNYAN	18AE PL B780 501		
		A.M. Sirunyan <i>et al.</i>	(CMS Collab.)
SIRUNYAN	18BD JHEP 1806 101	A.M. Sirunyan <i>et al.</i>	(CMS Collab.)
SIRUNYAN	18BH JHEP 1806 001		
SIRUNYAN	1000 11100 1000 000	A.M. Sirunyan <i>et al.</i>	(CMS Collab.)
	18BQ JHEP 1808 066	A.M. Sirunyan et al.	(CMS Collab.)
SIRUNYAN	18BU EPJ C78 140	A.M. Sirunyan <i>et al.</i> A.M. Sirunyan <i>et al.</i>	(CMS Collab.) (CMS Collab.)
SIRUNYAN	18BU EPJ C78 140 18BV EPJ C78 291	A.M. Sirunyan <i>et al.</i> A.M. Sirunyan <i>et al.</i> A.M. Sirunyan <i>et al.</i>	(CMS Collab.) (CMS Collab.) (CMS Collab.)
SIRUNYAN SIRUNYAN	18BU EPJ C78 140 18BV EPJ C78 291 18DB PRL 121 121801	A.M. Sirunyan et al. A.M. Sirunyan et al. A.M. Sirunyan et al. A.M. Sirunyan et al.	(CMS Collab.) (CMS Collab.) (CMS Collab.) (CMS Collab.)
SIRUNYAN SIRUNYAN SIRUNYAN	18BU EPJ C78 140 18BV EPJ C78 291 18DB PRL 121 121801 18DQ JHEP 1811 152	A.M. Sirunyan et al. A.M. Sirunyan et al. A.M. Sirunyan et al. A.M. Sirunyan et al. A.M. Sirunyan et al.	(CMS Collab.) (CMS Collab.) (CMS Collab.) (CMS Collab.) (CMS Collab.)
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KHACHATRY 16CD P	PL B763 472 V	 Khachatryan et al. 	(CMS Collab.)
		/. Khachatryan <i>et al.</i>	(CMS Collab.)
AAD 15 PI	PL B740 222 G	6. Aad <i>et al.</i>	(ATLAS Collab.)
		6. Aad et al.	(ATLAS Collab.)
AAD 15AH JH	HEP 1504 117 G	6. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 15AQ JH		5. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 15AX EI	PJ C75 231 G	6. Aad <i>et al.</i>	(ATLAS Collab.)
		5. Aad <i>et al.</i>	(ATLAS and CMS Collabs.)
AAD 15BC EI	PJ C75 349 G	5. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 15BD EI	PJ C75 337 G	5. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 15BE EI	PJ C75 335 G	5. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 15CE P	PR D92 092004 G	6. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 15CI EI	PJ C75 476 G	5. Aad <i>et al.</i>	(ATLAS Collab.)
Also El		5. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 15CX JH	HEP 1511 206 G	5. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 15F P	PR D91 012006 G	6. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 15G JH	HEP 1501 069 G	5. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 15I P	PRL 114 121801 G	6. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 15P P	RL 115 091801 G	6. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 15T P	PL B749 519 G	6. Aad <i>et al.</i>	(ATLAS Collab.)
AALTONEN 15 P	RL 114 151802 T	. Aaltonen <i>et al.</i>	(CDF and D0 Collabs.)
AALTONEN 15B P	PRL 114 141802 T	. Aaltonen <i>et al.</i>	(CDF Collab.)
KHACHATRY 15AM EI		/. Khachatryan <i>et al.</i>	(CMS Collab.)
KHACHATRY 15AN EI	:PJ C75 251 V	 Khachatryan et al. 	(CMS Collab.)
KHACHATRY 15BA P		/. Khachatryan et al.	(CMS Collab.)
KHACHATRY 15H P	PL B744 184 V	 Khachatryan et al. 	(CMS Collab.)
		/. Khachatryan <i>et al.</i>	(CMS Collab.)
KHACHATRY 15Y P	PR D92 012004 V	 Khachatryan et al. 	(CMS Collab.)
KHACHATRY 15Z P		/. Khachatryan <i>et al.</i>	(CMS Collab.)
AAD 14AR P	PL B738 234 G	6. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 14AS P	PL B738 68 G	6. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 14BC P	PR D90 112015 G	5. Aad <i>et al.</i>	(ATLAS Collab.)
		6. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 14J PI	PL B732 8 G	6. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 140 P	PRL 112 201802 G	6. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 14W P	PR D90 052004 G	6. Aad <i>et al.</i>	(ATLAS Collab.)
ABAZOV 14F P	PRL 113 161802 V	/.M. Abazov <i>et al.</i>	D0 Collab.)
CHATRCHYAN 14AA P	YR D89 092007 S	. Chatrchyan <i>et al.</i>	(CMS Collab.)
CHATRCHYAN 14AI P	PR D89 012003 S	. Chatrchyan et al.	(CMS Collab.)
CHATRCHYAN 14AJ N	JATP 10 557 S	. Chatrchyan <i>et al.</i>	(CMS Collab.)
		. Chatrchyan <i>et al.</i>	(CMS Collab.)
CHATRCHYAN 14G JH	HEP 1401 096 S	. Chatrchyan <i>et al.</i>	(CMS Collab.)
CHATRCHYAN 14K JH	HEP 1405 104 S	. Chatrchyan et al.	(CMS Collab.)
KHACHATRY 14D P	PL B736 64 V	 Khachatryan et al. 	(CMS Collab.)
KHACHATRY 14H JH	HEP 1409 087 V	/. Khachartryan <i>et al.</i>	(CMS Collab.)
KHACHATRY 14P EI	EPJ C74 3076 V	 Khachatryan et al. 	(CMS Collab.)
AAD 13AJ P	PL B726 120 G	6. Aad <i>et al.</i>	(ATLAS Collab.)
AAD 13AK P	PL B726 88 G	6. Aad <i>et al.</i>	(ATLAS Collab.)
Also Pl	PL B734 406 (errat.) G	6. Aad <i>et al.</i>	(ATLAS Collab.)
AALTONEN 13L P	PR D88 052013 T	. Aaltonen <i>et al.</i>	(CDF Collab.)
AALTONEN 13M P	PR D88 052014 T	. Aaltonen <i>et al.</i>	(CDF and D0 Collabs.)
		/.M. Abazov <i>et al.</i>	(D0 Collab.)
CHATRCHYAN 13BK P	PL B726 587 S	. Chatrchyan et al.	(CMS Collab.)
			(CMS Collab.)
		. Chatrchyan <i>et al.</i>	
CHATRCHYAN 13X JH	HEP 1305 145 S	. Chatrchyan et al.	(CMS Collab.)
			(CMS Collab.)
		. Chatrchyan <i>et al.</i>	
HEINEMEYER 13A ar	rXiv:1307.1347 S	. Heinemeyer <i>et al.</i>	(LHC Higgs CS Working Group)
		6. Aad <i>et al.</i>	
			(ATLAS Collab.)
AAD 12DA SO	CI 338 1576 G	6. Aad <i>et al.</i>	(ATLAS Collab.)
		. Aaltonen <i>et al.</i>	(CDF_Collab.)
AALTONEN 12R P	PRL 109 111804 T	. Aaltonen <i>et al.</i>	(CDF Collab.)
		. Aaltonen <i>et al.</i>	(CDF Collab.)
AALIONLIN 123 FI	PRI 100 111805 I		
AALTONEN 12T P		. Aaltonen <i>et al.</i>	(CDF and D0 Collabs.)
	PRL 109 071804 T	. Aaltonen <i>et al.</i>	(CDF and D0 Collabs.)
ABAZOV 12K P	PRL 109 071804 T PL B716 285 V	[–] . Aaltonen <i>et al.</i> /.M. Abazov <i>et al.</i>	(CDF and D0 Collabs.) (D0 Collab.)
ABAZOV 12K P	PRL 109 071804 T PL B716 285 V	. Aaltonen <i>et al.</i>	(CDF and D0 Collabs.)
ABAZOV 12K P ABAZOV 120 P	PRL 109 071804 T PL B716 285 V PRL 109 121803 V	⁻ . Aaltonen <i>et al.</i> /.M. Abazov <i>et al.</i> /.M. Abazov <i>et al.</i>	(CDF and D0 Collabs.) (D0 Collab.) (D0 Collab.)
ABAZOV 12K P ABAZOV 12O P ABAZOV 12P P	PRL 109 071804 T PL B716 285 V PRL 109 121803 V PRL 109 121804 V	⁻ . Aaltonen <i>et al.</i> /.M. Abazov <i>et al.</i> /.M. Abazov <i>et al.</i> /.M. Abazov <i>et al.</i>	(CDF and D0 Collabs.) (D0 Collab.) (D0 Collab.) (D0 Collab.) (D0 Collab.)
ABAZOV 12K P ABAZOV 120 P	PRL 109 071804 T PL B716 285 V PRL 109 121803 V PRL 109 121804 V	⁻ . Aaltonen <i>et al.</i> /.M. Abazov <i>et al.</i> /.M. Abazov <i>et al.</i>	(CDF and D0 Collabs.) (D0 Collab.) (D0 Collab.)
ABAZOV 12K P ABAZOV 12O P ABAZOV 12P P CHATRCHYAN 12BY SO	PRL 109 071804 T PL B716 285 V PRL 109 121803 V PRL 109 121803 V PRL 109 121804 V PRL 109 121804 V PRL 103 1569 S	. Aaltonen <i>et al.</i> /.M. Abazov <i>et al.</i> /.M. Abazov <i>et al.</i> /.M. Abazov <i>et al.</i> 5. Chatrchyan <i>et al.</i>	(CDF and D0 Collabs.) (D0 Collab.) (D0 Collab.) (D0 Collab.) (CMS Collab.)
ABAZOV 12K P ABAZOV 12O P ABAZOV 12P P CHATRCHYAN 12BY S CHATRCHYAN 12N P	PRL 109 071804 T PL B716 285 V PRL 109 121803 V PRL 109 121804 V CCI 338 1569 S PL B716 30 S	 Aaltonen et al. M. Abazov et al. M. Abazov et al. M. Abazov et al. Chatrchyan et al. Chatrchyan et al. 	(CDF and D0 Collabs.) (D0 Collab.) (D0 Collab.) (D0 Collab.) (CMS Collab.) (CMS Collab.)
ABAZOV 12K P ABAZOV 12O P ABAZOV 12P P CHATRCHYAN 12BY S CHATRCHYAN 12N P	PRL 109 071804 T PL B716 285 V PRL 109 121803 V PRL 109 121804 V CCI 338 1569 S PL B716 30 S	. Aaltonen <i>et al.</i> /.M. Abazov <i>et al.</i> /.M. Abazov <i>et al.</i> /.M. Abazov <i>et al.</i> 5. Chatrchyan <i>et al.</i>	(CDF and D0 Collabs.) (D0 Collab.) (D0 Collab.) (D0 Collab.) (CMS Collab.)
ABAZOV 12K P ABAZOV 12O P ABAZOV 12P P CHATRCHYAN 12BY S CHATRCHYAN 12N P DITTMAIER 12 ar	PRL 109 071804 T PL B716 285 V PRL 109 121803 V PRL 109 121804 V CIC 338 1569 S PL B716 30 S rXiv:1201.3084 S S	 Aaltonen et al. M. Abazov et al. M. Abazov et al. M. Abazov et al. Chatrchyan et al. Chatrchyan et al. Dittmaier et al. 	(CDF and D0 Collabs.) (D0 Collab.) (D0 Collab.) (D0 Collab.) (CMS Collab.) (CMS Collab.) (LHC Higgs CS Working Group)
ABAZOV 12K P ABAZOV 12O P ABAZOV 12P P CHATRCHYAN 12BY S CHATRCHYAN 12N P DITTMAIER 12 ar	PRL 109 071804 T PL B716 285 V PRL 109 121803 V PRL 109 121804 V CIC 338 1569 S PL B716 30 S rXiv:1201.3084 S S	 Aaltonen et al. M. Abazov et al. M. Abazov et al. M. Abazov et al. Chatrchyan et al. Chatrchyan et al. 	(CDF and D0 Collabs.) (D0 Collab.) (D0 Collab.) (D0 Collab.) (CMS Collab.) (CMS Collab.)
ABAZOV 12K P ABAZOV 12O P ABAZOV 12P P CHATRCHYAN 12BY S CHATRCHYAN 12N P DITTMAIER 12 ar	PRL 109 071804 T PL B716 285 V PRL 109 121803 V PRL 109 121804 V CIC 338 1569 S PL B716 30 S rXiv:1201.3084 S S	 Aaltonen et al. M. Abazov et al. M. Abazov et al. M. Abazov et al. Chatrchyan et al. Chatrchyan et al. Dittmaier et al. 	(CDF and D0 Collabs.) (D0 Collab.) (D0 Collab.) (D0 Collab.) (CMS Collab.) (CMS Collab.) (LHC Higgs CS Working Group)