Neutral Higgs Bosons, Searches for

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MASS LIMITS FOR NEUTRAL HIGGS BOSONS IN SUPERSYMMETRIC MODELS

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The minimal supersymmetric model has two complex doublets of Higgs bosons. The resulting physical states are two scalars [H_1^0 and H_2^0, where we define $m_{H_1^0} < m_{H_2^0}$], a pseudoscalar (A^0), and a charged Higgs pair ($H^\pm$). H_1^0 and H_2^0 are also called h and H in the literature. There are two free parameters in the Higgs sector which can be chosen to be m_{A^0} and $\tan\beta = v_2/v_1$, the ratio of vacuum expectation values of the two Higgs doublets. Tree-level Higgs masses are constrained by the model to be $m_{H_1^0} \le m_Z$, $m_{H_2^0} \ge m_Z$, $m_{A^0} \ge m_{H_1^0}$, and $m_{H^\pm} \ge m_W$. However, as described in the review on "Status of Higgs Boson Physics" in this Volume these relations are violated by radiative corrections.

The observed signal at about 125 GeV, see section "H", can be interpreted as one of the neutral Higgs bosons of supersymmetric models. Unless otherwise noted, we identify the lighter scalar H_1^0 with the Higgs discovered at 125 GeV at the LHC (AAD 12AI, CHATRCHYAN 12N).

Unless otherwise noted, the experiments in e^+e^- collisions search for the processes $e^+e^- \to H_1^0 Z^0$ in the channels used for the Standard Model Higgs searches and $e^+e^- \to H_1^0 A^0$ in the final states $b\bar{b}b\bar{b}$ and $b\bar{b}\tau^+\tau^-$. Unless otherwise stated, the following results assume no invisible H_1^0 or A^0 decays. Unless otherwise noted, the results are given in the m_h^{max} scenario, CARENA 13.

In $p\bar{p}$ and pp collisions the experiments search for a variety of processes, as explicitly specified for each entry. Limits on the A^0 mass arise from these direct searches, as well as from the relations valid in the minimal supersymmetric model between m_{A^0} and $m_{H_1^0}$. As discussed in the review on "Status of Higgs Boson Physics" in this Volume, these relations depend, via potentially large radiative corrections, on the mass of the t quark and on the supersymmetric parameters, in particular those of the stop sector. These indirect limits are weaker for larger t and $\tilde{t}$ masses. To include the radiative corrections to the Higgs masses, unless otherwise stated, the listed papers use theoretical predictions incorporating two-loop corrections and beyond (SLAVICH 21), and the results are given for the M_h^{125} benchmark scenario, see BAGNASCHI 19.

Mass Limits for heavy neutral Higgs bosons (H_2^0, A^0) in the MSSM

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The limits rely on $pp \to H_2^0/A^0 \to \tau^+\tau^-$ and assume that H_2^0 and A^0 are (sufficiently) mass degenerate. The limits depend on $\tan\beta$.

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VALUE (GeV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*	
> 835	95	[1] TUMASYAN	23S	CMS	$\tan\beta = 10$ GeV	
>1240	95	[1] TUMASYAN	23S	CMS	$\tan\beta = 20$ GeV	OCCUR=2
>1605	95	[1] TUMASYAN	23S	CMS	$\tan\beta = 30$ GeV	OCCUR=3
>1820	95	[1] TUMASYAN	23S	CMS	$\tan\beta = 40$ GeV	OCCUR=4
>1950	95	[1] TUMASYAN	23S	CMS	$\tan\beta = 50$ GeV	OCCUR=5

>2062	95	[1] TUMASYAN	23S	CMS	tanβ = 60 GeV	OCCUR=6
>1121	95	[2] AAD	20AA	ATLS	tanβ = 10 GeV	
>1475	95	[2] AAD	20AA	ATLS	tanβ = 20 GeV	OCCUR=2
>1677	95	[2] AAD	20AA	ATLS	tanβ = 30 GeV	OCCUR=3
>1826	95	[2] AAD	20AA	ATLS	tanβ = 40 GeV	OCCUR=4
>1937	95	[2] AAD	20AA	ATLS	tanβ = 50 GeV	OCCUR=5
>2033	95	[2] AAD	20AA	ATLS	tanβ = 60 GeV	OCCUR=6

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

		[3] CHEKHOVSKY	25C	CMS	$H_2^0/A^0 \rightarrow b\overline{b}$	
		[4] CHEKHOVSKY	25I	CMS	$A^0 \rightarrow ZH$	
		[5] AAD	24AP	ATLS	H_2^0, $A^0 \rightarrow t\overline{t}$	
		[6] AAD	24CB	ATLS	H properties	
		[7] AAD	24H	ATLS	$H_2^0 \rightarrow HH$	
		[8] AAD	20	ATLS	H properties	
		[9] AAD	20C	ATLS	$H_2^0 \rightarrow HH$	
		[10] AAD	20L	ATLS	$H_2^0 \rightarrow b\overline{b}$	
		[11] SIRUNYAN	20AC	CMS	$A^0 \rightarrow ZH$	
		[12] SIRUNYAN	20AF	CMS	$H_2^0/A^0 \rightarrow t\overline{t}$	
		[13] SIRUNYAN	20Y	CMS	$H_2^0 \rightarrow W^+W^-$	
		[14] SIRUNYAN	19CR	CMS	$H_2^0/A^0 \rightarrow \mu^+\mu^-$	
> 377	95	[15] AABOUD	18G	ATLS	tanβ = 10 GeV	
> 863	95	[15] AABOUD	18G	ATLS	tanβ = 20 GeV	OCCUR=2
>1157	95	[15] AABOUD	18G	ATLS	tanβ = 30 GeV	OCCUR=3
>1328	95	[15] AABOUD	18G	ATLS	tanβ = 40 GeV	OCCUR=4
>1483	95	[15] AABOUD	18G	ATLS	tanβ = 50 GeV	OCCUR=5
>1613	95	[15] AABOUD	18G	ATLS	tanβ = 60 GeV	OCCUR=6
		[16] SIRUNYAN	18A	CMS	$H_2^0 \rightarrow H^0H^0$	
		[17] SIRUNYAN	18BP	CMS	$pp \rightarrow H_2^0/A^0 + b + X$, $H_2^0/A^0 \rightarrow b\overline{b}$	
> 389	95	[18] SIRUNYAN	18CX	CMS	tanβ = 10 GeV	
> 832	95	[18] SIRUNYAN	18CX	CMS	tanβ = 20 GeV	OCCUR=2
>1148	95	[18] SIRUNYAN	18CX	CMS	tanβ = 30 GeV	OCCUR=3
>1341	95	[18] SIRUNYAN	18CX	CMS	tanβ = 40 GeV	OCCUR=4
>1496	95	[18] SIRUNYAN	18CX	CMS	tanβ = 50 GeV	OCCUR=5
>1613	95	[18] SIRUNYAN	18CX	CMS	tanβ = 60 GeV	OCCUR=6
		[19] AABOUD	16AA	ATLS	$A^0 \rightarrow \tau^+\tau^-$	
		[20] KHACHATRY...	16A	CMS	$H_{1,2}^0/A^0 \rightarrow \mu^+\mu^-$	
		[21] KHACHATRY...	16P	CMS	$H_2^0 \rightarrow H^0H^0$, $A^0 \rightarrow ZH^0$	
		[22] KHACHATRY...	15AY	CMS	$pp \rightarrow H_{1,2}^0/A^0 + b + X$, $H_{1,2}^0/A^0 \rightarrow b\overline{b}$	OCCUR=4
		[23] AAD	14AW	ATLS	$pp \rightarrow H_{1,2}^0/A^0 + X$, $H_{1,2}^0/A^0 \rightarrow \tau\tau$	
		[24] KHACHATRY...	14M	CMS	$pp \rightarrow H_{1,2}^0/A^0 + X$, $H_{1,2}^0/A^0 \rightarrow \tau\tau$	
		[25] AAD	13O	ATLS	$pp \rightarrow H_{1,2}^0/A^0 + X$, $H_{1,2}^0/A^0 \rightarrow \tau^+\tau^-$, $\mu^+\mu^-$	
		[26] AAIJ	13T	LHCB	$pp \rightarrow H_{1,2}^0/A^0 + X$, $H_{1,2}^0/A^0 \rightarrow \tau^+\tau^-$	
		[27] CHATRCHYAN	13AG	CMS	$pp \rightarrow H_{1,2}^0/A^0 + b + X$, $H_{1,2}^0/A^0 \rightarrow b\overline{b}$	
		[28] AALTONEN	12AQ	TEVA	$p\overline{p} \rightarrow H_{1,2}^0/A^0 + b + X$, $H_{1,2}^0/A^0 \rightarrow b\overline{b}$	
		[29] AALTONEN	12X	CDF	$p\overline{p} \rightarrow H_{1,2}^0/A^0 + b + X$, $H_{1,2}^0/A^0 \rightarrow b\overline{b}$	
		[30] ABAZOV	12G	D0	$p\overline{p} \rightarrow H_{1,2}^0/A^0 + X$, $H_{1,2}^0/A^0 \rightarrow \tau^+\tau^-$	

		[31] CHATRCHYAN	12K	CMS	$pp \to H^0_{1,2}/A^0 + X$, $H^0_{1,2}/A^0 \to \tau^+\tau^-$
		[32] ABAZOV	11K	D0	$p\overline{p} \to H^0_{1,2}/A^0 + b + X$, $H^0_{1,2}/A^0 \to b\overline{b}$
		[33] ABAZOV	11W	D0	$p\overline{p} \to H^0_{1,2}/A^0 + b + X$, $H^0_{1,2}/A^0 \to \tau^+\tau^-$
		[34] AALTONEN	09AR	CDF	$p\overline{p} \to H^0_{1,2}/A^0 + X$, $H^0_{1,2}/A^0 \to \tau^+\tau^-$
$>$ 90.4		[35] ABDALLAH	08B	DLPH	$E_{cm} \leq 209$ GeV
$>$ 93.4	95	[36] SCHAEL	06B	LEP	$E_{cm} \leq 209$ GeV
		[37] ACOSTA	05Q	CDF	$p\overline{p} \to H^0_{1,2}/A^0 + X$
$>$ 85.0	95	[38,39] ABBIENDI	04M	OPAL	$E_{cm} \leq 209$ GeV
		[40] ABBIENDI	03G	OPAL	$H^0_1 \to A^0 A^0$
$>$ 86.5	95	[38,41] ACHARD	02H	L3	$E_{cm} \leq 209$ GeV, $\tan\beta > 0.4$
		[42] AKEROYD	02	RVUE	
$>$ 90.1	95	[38,43] HEISTER	02	ALEP	$E_{cm} \leq 209$ GeV, $\tan\beta > 0.5$

[1] TUMASYAN 23S search for production of $H^0_2/A^0 \to \tau^+\tau^-$ by gluon fusion and b-associated prodution using 138 fb^{-1} of pp collisions at $E_{cm} = 13$ TeV. See their Fig. 13 for excluded regions in the m_{A^0}–$\tan\beta$ plane in M_h^{125} and M_{hEFT}^{125} MSSM scenarios. In both scenarios $m_{A^0} < 350$ GeV is excluded at 95% CL. NODE=S055HAD;LINKAGE=N

[2] AAD 20AA search for $H^0_2/A^0 \to \tau^+\tau^-$ produced by gluon fusion or b-associated production using 139 fb^{-1} of pp collisions at $E_{cm} = 13$ TeV. See their Fig. 2(c) for excluded region in the M_h^{125} scenario of MSSM. Values of $\tan\beta > 8$ (21) are excluded for $m_{A^0} = 1.0$ (1.5) TeV at 95%CL. NODE=S055HAD;LINKAGE=G

[3] CHEKHOVSKY 25C search for $H^0_2/A^0 \to b\overline{b}$ by b-associated prodution using 36.7–126.9 fb^{-1} of pp collisions at $E_{cm} = 13$ TeV. See their Figs. 16–18 for excluded regions in the m_{A^0}–$\tan\beta$ plane in various MSSM scenarios. NODE=S055HAD;LINKAGE=W

[4] CHEKHOVSKY 25I search for production of an A^0 in gluon-gluon fusion and in association with a $b\overline{b}$, decaying to ZH in the final states $\ell^+\ell^-\tau^+\tau^-$, assuming B($H \to \tau^+\tau^-$) of the SM, using 138 fb^{-1} of pp collisions at $E_{cm} = 13$ TeV. See their Fig. 7 for excluded parameter region in M_{hEFT}^{125} MSSM scenario. NODE=S055HAD;LINKAGE=X

[5] AAD 24AP search for production of a heavy H^0_2 and A^0 decaying to $t\overline{t}$ in 140 fb^{-1} of pp collisions at $E_{cm} = 13$ TeV. See their Fig. 13(b) for excluded parameter regions in hMSSM. NODE=S055HAD;LINKAGE=P

[6] AAD 24CB use ATLAS measurements from up to 139 fb^{-1} of H production cross sections and decays to constrain the MSSM Higgs sector. See their Figs. 22 and 23 for excluded regions in various MSSM scenarios. NODE=S055HAD;LINKAGE=T

[7] AAD 24H combine searches for a scalar resonance decaying to HH using up to 139 fb^{-1} of pp collisions at $E_{cm} = 13$ TeV from AAD 22F, AAD 23Z, and AAD 22Y. See their Fig. 3 for the excluded region in the MSSM $M_{h,EFT}^{125}$ and $M_{h,EFT}^{125}(\widetilde{\chi})$ benchmark scenarios (where only the resonant H-exchange contribution has been taken into account in the signal modelling). NODE=S055HAD;LINKAGE=O

[8] AAD 20 combine measurements on H production and decay using data taken in years 2015–2017 (up to 79.8 fb^{-1}) of pp collisions at $E_{cm} = 13$ TeV. See their Fig. 19 for excluded region in the hMSSM parameter space. NODE=S055HAD;LINKAGE=F

[9] AAD 20C combine searches for a scalar resonance decaying to HH in 36.1 fb^{-1} of pp collisions at $E_{cm} = 13$ TeV from AABOUD 19A, AABOUD 19O, AABOUD 18CQ, AABOUD 19T, AABOUD 18CW, and AABOUD 18BU. See their Fig. 7(b) for the excluded region in the hMSSM parameter space. NODE=S055HAD;LINKAGE=C

[10] AAD 20L search for b-associated production of H^0_2 decaying to $b\overline{b}$ in 27.8 fb^{-1} of pp collisions at $E_{cm} = 13$ TeV. See their Fig. 9 for excluded regions in hMSSM, $\mathrm{m}_h^{\mathrm{mod}+}$ and $\mathrm{m}_h^{\mathrm{mod}-}$ scenarios of MSSM. NODE=S055HAD;LINKAGE=L

[11] SIRUNYAN 20AC search for gluon-fusion and b-associated production of A^0 decaying to ZH in 35.9 fb^{-1} of pp collisions at $E_{cm} = 13$ TeV. See their Fig. 6 for excluded regions in the M_{hEFT}^{125} and hMSSM scenarios of the MSSM. NODE=S055HAD;LINKAGE=J

[12] SIRUNYAN 20AF search for $H^0_2/A^0 \to t\overline{t}$ with one or two charged leptons in the final state using kinematic variables in 35.9 fb^{-1} of pp collisions at $E_{cm} = 13$ TeV. See their Fig. 8 for excluded region in the hMSSM scenario of MSSM. Values of $\tan\beta$ below 1.0–1.5 are excluded for $m_{A^0} = 0.4$–0.75 TeV at 95%CL. NODE=S055HAD;LINKAGE=I

[13] SIRUNYAN 20Y search for gluon-fusion and vector-boson-fusion production of H^0_2 decaying to W^+W^- in the final states $\ell\nu\ell\nu$ and $\ell\nu qq$ in 35.9 fb^{-1} of pp collisions at $E_{cm} = 13$ TeV. See their Figs. 8 and 9 for excluded regions in various MSSM scenarios. NODE=S055HAD;LINKAGE=K

[14] SIRUNYAN 19CR search for production of H_2^0/A^0 in gluon fusion and in association with a $b\overline{b}$ pair, decaying to $\mu^+\mu^-$ in 35.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 5 for the excluded region in the MSSM parameter space in the m_h^{mod+} and hMSSM scenarios. NODE=S055HAD;LINKAGE=D

[15] AABOUD 18G search for production of $H_2^0/A^0 \rightarrow \tau^+\tau^-$ by gluon fusion and b-associated prodution in 36.1 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 10 for excluded regions in the m_{A^0}– tanβ plane in several MSSM scenarios. NODE=S055HAD;LINKAGE=A

[16] SIRUNYAN 18A search for production of a scalar resonance decaying to $H^0 H^0 \rightarrow b\overline{b}\tau^+\tau^-$ in 35.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 5 (lower) for excluded regions in the m_{A^0} − tanβ plane in the hMSSM scenario. NODE=S055HAD;LINKAGE=V

[17] SIRUNYAN 18BP search for production of $H_2^0/A^0 \rightarrow b\overline{b}$ by b-associated prodution in 35.7 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 6 for the limits on cross section times branching ratio for $m_{H_2^0}$, m_{A^0} = 0.3–1.3 TeV, and Fig. 7 for excluded regions in the m_{A^0}– tan(β) plane in several MSSM scenarios. NODE=S055HAD;LINKAGE=Y

[18] SIRUNYAN 18CX search for production of $H_{1,2}^0/A^0 \rightarrow \tau^+\tau^-$ by gluon fusion and b-associated prodution in 35.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 9 for excluded regions in the m_{A^0}– tan(β) plane in several MSSM scenarios. NODE=S055HAD;LINKAGE=B

[19] AABOUD 16AA search for production of a Higgs boson in gluon fusion and in association with a $b\overline{b}$ pair followed by the decay $A^0 \rightarrow \tau^+\tau^-$ in 3.2 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 5(a, b) for limits on cross section times branching ratio for m_{A^0} = 200–1200 GeV, and Fig. 5(c, d) for the excluded region in the MSSM parameter space in the m_h^{mod+} and hMSSM scenarios. NODE=S055HAD;LINKAGE=U

[20] KHACHATRYAN 16A search for production of a Higgs boson in gluon fusion and in association with a $b\overline{b}$ pair followed by the decay $H_{1,2}^0/A^0 \rightarrow \mu^+\mu^-$ in 5.1 fb^{-1} of pp collisions at E_{cm} = 7 TeV and 19.3 fb^{-1} at E_{cm} = 8 TeV. See their Fig. 7 for the excluded region in the MSSM parameter space in the m_h^{mod+} benchmark scenario and Fig. 9 for limits on cross section times branching ratio. NODE=S055HAD;LINKAGE=Q

[21] KHACHATRYAN 16P search for gluon fusion production of an H_2^0 decaying to $H^0 H^0 \rightarrow b\overline{b}\tau^+\tau^-$ and an A^0 decaying to $Z H^0 \rightarrow \ell^+\ell^-\tau^+\tau^-$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 12 for excluded region in the tanβ − cos($\beta - \alpha$) plane for $m_{H_2^0} = m_{A^0}$ = 300 GeV. NODE=S055HAD;LINKAGE=R

[22] KHACHATRYAN 15AY search for production of a Higgs boson in association with a b quark in the decay $H_{1,2}^0/A^0 \rightarrow b\overline{b}$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV and combine with CHATRCHYAN 13AG 7 TeV data. See their Fig. 6 for the limits on cross section times branching ratio for m_{A^0} = 100–900 GeV and Figs. 7–9 for the excluded region in the MSSM parameter space in various benchmark scenarios. NODE=S055HAD;LINKAGE=S

[23] AAD 14AW search for production of a Higgs boson followed by the decay $H_{1,2}^0/A^0 \rightarrow \tau^+\tau^-$ in 19.5–20.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 11 for the limits on cross section times branching ratio and their Figs. 9 and 10 for the excluded region in the MSSM parameter space. For m_{A^0} = 140 GeV, the region tan$\beta > 5.4$ is excluded at 95% CL in the m_h^{max} scenario. NODE=S055HAD;LINKAGE=E

[24] KHACHATRYAN 14M search for production of a Higgs boson in gluon fusion and in association with a b quark followed by the decay $H_{1,2}^0/A^0 \rightarrow \tau^+\tau^-$ in 4.9 fb^{-1} of pp collisions at E_{cm} = 7 TeV and 19.7 fb^{-1} at E_{cm} = 8 TeV. See their Figs. 7 and 8 for one- and two-dimensional limits on cross section times branching ratio and their Figs. 5 and 6 for the excluded region in the MSSM parameter space. For m_{A^0} = 140 GeV, the region tan$\beta > 3.8$ is excluded at 95% CL in the m_h^{max} scenario. NODE=S055HAD;LINKAGE=H

[25] AAD 13O search for production of a Higgs boson in the decay $H_{1,2}^0/A^0 \rightarrow \tau^+\tau^-$ and $\mu^+\mu^-$ with 4.7–4.8 fb^{-1} of pp collisions at E_{cm} = 7 TeV. See their Fig. 6 for the excluded region in the MSSM parameter space and their Fig. 7 for the limits on cross section times branching ratio. For m_{A^0} = 110–170 GeV, tan$\beta \gtrsim 10$ is excluded, and for tan$\beta = 50$, m_{A^0} below 470 GeV is excluded at 95% CL in the m_h^{max} scenario. NODE=S055HAD;LINKAGE=GA

[26] AAIJ 13T search for production of a Higgs boson in the forward region in the decay $H_{1,2}^0/A^0 \rightarrow \tau^+\tau^-$ in 1.0 fb^{-1} of pp collisions at E_{cm} = 7 TeV. See their Fig. 2 for the limits on cross section times branching ratio and the excluded region in the MSSM parameter space. NODE=S055HAD;LINKAGE=AI

[27] CHATRCHYAN 13AG search for production of a Higgs boson in association with a b quark in the decay $H_{1,2}^0/A^0 \rightarrow b\overline{b}$ in 2.7–4.8 fb^{-1} of pp collisions at E_{cm} = 7 TeV. See their Fig. 6 for the excluded region in the MSSM parameter space and Fig. 5 for the limits on cross section times branching ratio. For m_{A^0} = 90–350 GeV, upper bounds on tanβ of 18–42 at 95% CL are obtained in the m_h^{max} scenario with μ = +200 GeV. NODE=S055HAD;LINKAGE=CR

[28] AALTONEN 12AQ combine AALTONEN 12X and ABAZOV 11K. See their Table I and Fig. 1 for the limit on cross section times branching ratio and Fig. 2 for the excluded region in the MSSM parameter space. NODE=S055HAD;LINKAGE=OC

[29] AALTONEN 12X search for associated production of a Higgs boson and a b quark in the decay $H^0_{1,2}/A^0 \rightarrow b\overline{b}$, with 2.6 fb^{-1} of $p\overline{p}$ collisions at E_{cm} = 1.96 TeV. See their Table III and Fig. 15 for the limit on cross section times branching ratio and Figs. 17, 18 for the excluded region in the MSSM parameter space. NODE=S055HAD;LINKAGE=TA

[30] ABAZOV 12G search for production of a Higgs boson in the decay $H^0_{1,2}/A^0 \rightarrow \tau^+\tau^-$ with 7.3 fb^{-1} of $p\overline{p}$ collisions at E_{cm} = 1.96 TeV and combine with ABAZOV 11W and ABAZOV 11K. See their Figs. 4, 5, and 6 for the excluded region in the MSSM parameter space. For m_{A^0} = 90–180 GeV, tan$\beta \gtrsim$ 30 is excluded at 95% CL. in the m_h^{max} scenario. NODE=S055HAD;LINKAGE=VM

[31] CHATRCHYAN 12K search for production of a Higgs boson in the decay $H^0_{1,2}/A^0 \rightarrow \tau^+\tau^-$ with 4.6 fb^{-1} of pp collisions at E_{cm} = 7 TeV. See their Fig. 3 and Table 4 for the excluded region in the MSSM parameter space. For m_{A^0} = 160 GeV, the region tanβ > 7.1 is excluded at 95% CL in the m_h^{max} scenario. Superseded by KHACHATRYAN 14M. NODE=S055HAD;LINKAGE=CT

[32] ABAZOV 11K search for associated production of a Higgs boson and a b quark, followed by the decay $H^0_{1,2}/A^0 \rightarrow b\overline{b}$, in 5.2 fb^{-1} of $p\overline{p}$ collisions at E_{cm} = 1.96 TeV. See their Fig. 5/Table 2 for the limit on cross section times branching ratio and Fig. 6 for the excluded region in the MSSM parameter space for $\mu = -200$ GeV. NODE=S055HAD;LINKAGE=A2

[33] ABAZOV 11W search for associated production of a Higgs boson and a b quark, followed by the decay $H^0_{1,2}/A^0 \rightarrow \tau\tau$, in 7.3 fb^{-1} of $p\overline{p}$ collisions at E_{cm} = 1.96 TeV. See their Fig. 2 for the limit on cross section times branching ratio and for the excluded region in the MSSM parameter space. NODE=S055HAD;LINKAGE=A1

[34] AALTONEN 09AR search for Higgs bosons decaying to $\tau^+\tau^-$ in two doublet models in 1.8 fb^{-1} of $p\overline{p}$ collisions at E_{cm} = 1.96 TeV. See their Fig. 2 for the limit on $\sigma \cdot$ B($H^0_{1,2}/A^0 \rightarrow \tau^+\tau^-$) for different Higgs masses, and see their Fig. 3 for the excluded region in the MSSM parameter space. NODE=S055HAD;LINKAGE=TN

[35] ABDALLAH 08B give limits in eight CP-conserving benchmark scenarios and some CP-violating scenarios. See paper for excluded regions for each scenario. Supersedes ABDALLAH 04. NODE=S055HAD;LINKAGE=AD

[36] SCHAEL 06B make a combined analysis of the LEP data. The quoted limit is for the m_h^{max} scenario with m_t = 174.3 GeV. In the CP-violating CPX scenario no lower bound on $m_{H^0_1}$ can be set at 95% CL. See paper for excluded regions in various scenarios. See Figs. 2–6 and Tabs. 14–21 for limits on $\sigma(Z H^0)\cdot$ B($H^0 \rightarrow b\overline{b}, \tau^+\tau^-$) and $\sigma(H^0_1 H^0_2)\cdot$ B($H^0_1,H^0_2 \rightarrow b\overline{b},\tau^+\tau^-$). NODE=S055HAD;LINKAGE=SH

[37] ACOSTA 05Q search for $H^0_{1,2}/A^0$ production in $p\overline{p}$ collisions at E_{cm} = 1.8 TeV with $H^0_{1,2}/A^0 \rightarrow \tau^+\tau^-$. At m_{A^0} = 100 GeV, the obtained cross section upper limit is above theoretical expectation. NODE=S055HAD;LINKAGE=AC

[38] Search for $e^+e^- \rightarrow H^0_1 A^0$ in the final states $b\overline{b}b\overline{b}$ and $b\overline{b}\tau^+\tau^-$, and $e^+e^- \rightarrow H^0_1 Z$. Universal scalar mass of 1 TeV, SU(2) gaugino mass of 200 GeV, and $\mu = -200$ GeV are assumed, and two-loop radiative corrections incorporated. The limits hold for m_t=175 GeV, and for the m_h^{max} scenario. NODE=S055HAD;LINKAGE=HL

[39] ABBIENDI 04M exclude 0.7 < tanβ < 1.9, assuming m_t = 174.3 GeV. Limits for other MSSM benchmark scenarios, as well as for CP violating cases, are also given. NODE=S055HAD;LINKAGE=HO

[40] ABBIENDI 03G search for $e^+e^- \rightarrow H^0_1 Z$ followed by $H^0_1 \rightarrow A^0 A^0$, $A^0 \rightarrow c\overline{c}$, gg, or $\tau^+\tau^-$. In the no-mixing scenario, the region $m_{H^0_1}$ = 45-85 GeV and m_{A^0} = 2-9.5 GeV is excluded at 95% CL. NODE=S055HAD;LINKAGE=AB

[41] ACHARD 02H also search for the final state $H^0_1 Z \rightarrow 2A^0 q\overline{q}$, $A^0 \rightarrow q\overline{q}$. In addition, the MSSM parameter set in the "large-μ" and "no-mixing" scenarios are examined. NODE=S055HAD;LINKAGE=RH

[42] AKEROYD 02 examine the possibility of a light A^0 with tanβ <1. Electroweak measurements are found to be inconsistent with such a scenario. NODE=S055HAD;LINKAGE=SY

[43] HEISTER 02 excludes the range 0.7 <tanβ < 2.3. A wider range is excluded with different stop mixing assumptions. Updates BARATE 01C. NODE=S055HAD;LINKAGE=HN

Mass Limits for H^0_1 (Higgs Boson) in Supersymmetric Models

NODE=S055HSS
NODE=S055HSS

VALUE (GeV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
>89.7		[1] ABDALLAH	08B	DLPH	$E_{\mathrm{cm}} \leq$ 209 GeV
>92.8	95	[2] SCHAEL	06B	LEP	$E_{\mathrm{cm}} \leq$ 209 GeV
>84.5	95	[3,4] ABBIENDI	04M	OPAL	$E_{\mathrm{cm}} \leq$ 209 GeV
>86.0	95	[3,5] ACHARD	02H	L3	$E_{\mathrm{cm}} \leq$ 209 GeV, tanβ > 0.4
>89.8	95	[3,6] HEISTER	02	ALEP	$E_{\mathrm{cm}} \leq$ 209 GeV, tanβ > 0.5
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[7] AALTONEN	12AQ	TEVA	$p\overline{p} \rightarrow H^0_{1,2}/A^0 + b + X$, $H^0_{1,2}/A^0 \rightarrow b\overline{b}$

[1] ABDALLAH 08B give limits in eight *CP*-conserving benchmark scenarios and some *CP*-violating scenarios. See paper for excluded regions for each scenario. Supersedes ABDALLAH 04. NODE=S055HSS;LINKAGE=AD

[2] SCHAEL 06B make a combined analysis of the LEP data. The quoted limit is for the m_h^{max} scenario with m_t = 174.3 GeV. In the *CP*-violating CPX scenario no lower bound on $m_{H_1^0}$ can be set at 95% CL. See paper for excluded regions in various scenarios. See Figs. 2–6 and Tabs. 14–21 for limits on $\sigma(Z H^0)\cdot$ B($H^0 \rightarrow b\overline{b}, \tau^+\tau^-$) and $\sigma(H_1^0 H_2^0)\cdot$ B($H_1^0,H_2^0 \rightarrow b\overline{b},\tau^+\tau^-$). NODE=S055HSS;LINKAGE=SH

[3] Search for $e^+e^- \rightarrow H_1^0 A^0$ in the final states $b\overline{b}b\overline{b}$ and $b\overline{b}\tau^+\tau^-$, and $e^+e^- \rightarrow H_1^0 Z$. Universal scalar mass of 1 TeV, SU(2) gaugino mass of 200 GeV, and $\mu = -200$ GeV are assumed, and two-loop radiative corrections incorporated. The limits hold for m_t=175 GeV, and for the m_h^{max} scenario. NODE=S055HSS;LINKAGE=HL

[4] ABBIENDI 04M exclude 0.7 < $\tan\beta$ < 1.9, assuming m_t = 174.3 GeV. Limits for other MSSM benchmark scenarios, as well as for *CP* violating cases, are also given. NODE=S055HSS;LINKAGE=HO

[5] ACHARD 02H also search for the final state $H_1^0 Z \rightarrow 2A^0 q\overline{q}$, $A^0 \rightarrow q\overline{q}$. In addition, the MSSM parameter set in the "large-μ" and "no-mixing" scenarios are examined. NODE=S055HSS;LINKAGE=RH

[6] HEISTER 02 excludes the range 0.7 <$\tan\beta$ < 2.3. A wider range is excluded with different stop mixing assumptions. Updates BARATE 01C. NODE=S055HSS;LINKAGE=HN

[7] AALTONEN 12AQ combine AALTONEN 12X and ABAZOV 11K. See their Table I and Fig. 1 for the limit on cross section times branching ratio and Fig. 2 for the excluded region in the MSSM parameter space. NODE=S055HSS;LINKAGE=OC

MASS LIMITS FOR NEUTRAL HIGGS BOSONS IN EXTENDED HIGGS MODELS

NODE=S055245

This Section covers models which do not fit into either the Standard Model or its simplest minimal Supersymmetric extension (MSSM), leading to anomalous production rates, or nonstandard final states and branching ratios. In particular, this Section covers limits which may apply to generic two-Higgs-doublet models (2HDM), or to special regions of the MSSM parameter space where decays to invisible particles or to photon pairs are dominant (see the review on "Status of Higgs Boson Physics"). Concerning the mass limits for H^0 and A^0 listed below, see the footnotes or the comment lines for details on the nature of the models to which the limits apply. NODE=S055245

The observed signal at about 125 GeV, see section "*H*", can be interpreted as one of the neutral Higgs bosons of an extended Higgs sector.

Mass Limits in General two-Higgs-doublet Models

NODE=S055H2D
NODE=S055H2D

VALUE (GeV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[1] AAD	25AL	ATLS	$t\overline{t}H_2^0/A^0$
		[2] CHEKHOVSKY	25C	CMS	$H_2^0/A^0 \rightarrow b\overline{b}$
		[3] HAYRAPETY...	25I	CMS	$A^0 \rightarrow Z H_2^0$, $H_2^0 \rightarrow t\overline{t}$
		[4] AAD	24AB	ATLS	$A^0 \rightarrow Z H_2^0$
		[5] AAD	24AP	ATLS	H_2^0, $A^0 \rightarrow t\overline{t}$
		[6] AAD	24CB	ATLS	H properties
		[7] AAD	24H	ATLS	$H_2^0 \rightarrow HH$
		[8] HAYRAPETY...	24H	CMS	flavor changing H_2^0, A^0
		[9] AAD	23AD	ATLS	$A^0 \rightarrow Z H_2^0$, $H_2^0 \rightarrow HH$
		[10] AAD	23BG	ATLS	$t\overline{t}H_2^0/A^0$
		[11] AAD	23O	ATLS	$A^0 \rightarrow ZH$
		[12] AAD	21AF	ATLS	$H_2^0 \rightarrow ZZ$
		[13] AAD	21AI	ATLS	$A^0 \rightarrow Z H_2^0$
		[14] AAD	20	ATLS	H^0 properties
		[15] AAD	20L	ATLS	$H_2^0 \rightarrow b\overline{b}$
		[16] SIRUNYAN	20AA	CMS	$H_2^0 \rightarrow Z A^0$ or $A^0 \rightarrow Z H_2^0$
		[17] SIRUNYAN	20Y	CMS	$H_2^0 \rightarrow W^+W^-$
		[18] SIRUNYAN	19AE	CMS	$A^0 \rightarrow \tau^+\tau^-$
		[19] SIRUNYAN	19AV	CMS	$A^0 \rightarrow Z H^0$
		[20] AABOUD	18AH	ATLS	$A^0 \rightarrow Z H_2^0$
		[21] AABOUD	18AI	ATLS	$A^0 \rightarrow Z H^0$
		[22] AABOUD	18BF	ATLS	$H_2^0 \rightarrow ZZ$
		[23] AABOUD	18CE	ATLS	$pp \rightarrow H_2^0/A^0 t\overline{t}$, $H_2^0/A^0 \rightarrow t\overline{t}$

		[24] HALLER	18	RVUE	global fits
		[25] SIRUNYAN	18BP	CMS	$pp \to H_2^0/A^0 + b + X$, $H_2^0/A^0 \to b\overline{b}$
		[26] SIRUNYAN	18ED	CMS	$A^0 \to ZH^0$
		[27] AABOUD	17AN	ATLS	H_2^0, $A^0 \to t\overline{t}$
		[28] SIRUNYAN	17AX	CMS	$A^0 b\overline{b}$, $A^0 \to \mu^+\mu^-$
		[29] AAD	16AX	ATLS	$H_2^0 \to ZZ$
		[30] KHACHATRY...	16P	CMS	$H_2^0 \to H^0 H^0$, $A^0 \to ZH^0$
		[31] KHACHATRY...	16W	CMS	$A^0 b\overline{b}$, $A^0 \to \tau^+\tau^-$
		[32] KHACHATRY...	16Z	CMS	$H_2^0 \to ZA^0$ or $A^0 \to ZH_2^0$
		[33] AAD	15BK	ATLS	$H_2^0 \to H^0 H^0$
		[34] AAD	15S	ATLS	$A^0 \to ZH^0$
		[35] KHACHATRY...	15BB	CMS	H_2^0, $A^0 \to \gamma\gamma$
		[36] KHACHATRY...	15N	CMS	$A^0 \to ZH^0$
		[37] AAD	14M	ATLS	$H_2^0 \to H^\pm W^\mp \to H^0 W^\pm W^\mp$, $H^0 \to b\overline{b}$
		[38] KHACHATRY...	14Q	CMS	$H_2^0 \to H^0 H^0$, $A^0 \to ZH^0$
		[39] AALTONEN	09AR	CDF	$p\overline{p} \to H_{1,2}^0/A^0 + X$, $H_{1,2}^0/A^0 \to \tau^+\tau^-$
none 1–55	95	[40] ABBIENDI	05A	OPAL	H_1^0, Type II model
$>$110.6	95	[41] ABDALLAH	05D	DLPH	$H^0 \to$ 2 jets
		[42] ABDALLAH	04O	DLPH	$Z \to f\overline{f}H$
		[43] ABDALLAH	04O	DLPH	$e^+e^- \to H^0 Z$, $H^0 A^0$
		[44] ABBIENDI	02D	OPAL	$e^+e^- \to b\overline{b}H$
none 1–44	95	[45] ABBIENDI	01E	OPAL	H_1^0, Type-II model
$>$ 68.0	95	[46] ABBIENDI	99E	OPAL	$\tan\beta > 1$
		[47] ABREU	95H	DLPH	$Z \to H^0 Z^*$, $H^0 A^0$
		[48] PICH	92	RVUE	Very light Higgs

OCCUR=2

[1] AAD 25AL search for production of H_2^0/A^0 in association with a $t\overline{t}$ pair, decaying to $t\overline{t}$, resulting in final states with one lepton or two opposite-sign leptons, using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 9 for excluded regions in the parameter space of the type II 2HDM. Combined limits with AAD 23BG are shown in Fig. 11. NODE=S055H2D;LINKAGE=MA

[2] CHEKHOVSKY 25C search for $H_2^0/A^0 \to b\overline{b}$ by b-associated production using 36.7–126.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 19 and 20 for excluded regions in the parameter space in Type II and flipped 2HDMs. NODE=S055H2D;LINKAGE=OA

[3] HAYRAPETYAN 25I search for $A^0 \to ZH_2^0$ with $H_2^0 \to t\overline{t}$ using 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 6 and 7 for excluded regions the 2HDM Type II. NODE=S055H2D;LINKAGE=NA

[4] AAD 24AB search for gluon-fusion and $b\overline{b}$ associated production of A^0 decaying to $A^0 \to ZH_2^0$, in the final states $\ell^+\ell^- t\overline{t}$ and $\nu\overline{\nu} b\overline{b}$ using 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 5 and 6 for limits on cross section times branching ratios in terms of two-Higgs-doublet models, and Fig. 7 for excluded model parameter space. NODE=S055H2D;LINKAGE=JA

[5] AAD 24AP search for production of a heavy H_2^0 and A^0 decaying to $t\overline{t}$ in 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 13(a) for excluded parameter regions in a Type II two-Higgs-doublet model. NODE=S055H2D;LINKAGE=KA

[6] AAD 24CB use ATLAS measurements from up to 139 fb^{-1} of H production cross sections and decays to constrain two Higgs doublet models. See their Figs. 19–21 for excluded regions of 2HDM parameter space. NODE=S055H2D;LINKAGE=LA

[7] AAD 24H combine searches for a scalar resonance decaying to HH using up to 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV from AAD 22F, AAD 23Z, and AAD 22Y. See their Fig. 2 for the excluded region in the Type-I two-Higgs-doublet model parameter space (where only the resonant H-exchange contribution has been taken into account in the signal modelling). NODE=S055H2D;LINKAGE=HA

[8] HAYRAPETYAN 24H search for H_2^0 and A^0 having flavor-violating couplings to tc or tu, produced in association with top quark(s), using 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. For the interpretation of the data in terms of flavor-violating two-Higs-doublet models, given in the range m_{A^0} = 0.2–1.0 TeV, see their Figs. 4, 5, and 6. NODE=S055H2D;LINKAGE=IA

[9] AAD 23AD search for associated production of W/ZH_2^0 and gluon fusion production of A^0 decaying to ZH_2^0, with the decay chain $H_2^0 \to HH \to b\overline{b}b\overline{b}$, using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 12 and 13 for excluded regions in Type-I and lepton-specific 2HDMs. NODE=S055H2D;LINKAGE=FA

[10] AAD 23BG search for production of H_2^0/A^0 in association with a $t\overline{t}$ pair, decaying to $t\overline{t}$, resulting in final states with two same-sign leptons or three or more leptons, using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 8 (corrected version in the erratum) for excluded regions in the parameter space of the type II 2HDM. NODE=S055H2D;LINKAGE=GA

[11] AAD 23O search for production of an A^0 in gluon-gluon fusion and in association with a $b\overline{b}$, decaying to ZH in the final states $\nu\overline{\nu}b\overline{b}$ and $\ell^+\ell^- b\overline{b}$ using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 12 and 13 for excluded regions in the parameter space in various 2HDMs. NODE=S055H2D;LINKAGE=EA

[12] AAD 21AF search for production of a heavy H_2^0 state decaying to ZZ in the final states $\ell^+\ell^-\ell'^+\ell'^-$ and $\ell^+\ell^-\nu\overline{\nu}$ in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 6 and 7 for excluded parameter regions of the 2HDM Type I and II. NODE=S055H2D;LINKAGE=BA

[13] AAD 21AI search for production of an A^0 in gluon-gluon fusion and in association with a $b\overline{b}$, decaying to $ZH_2^0 \rightarrow \ell^+\ell^- b\overline{b}$ or $\ell^+\ell^- W^+W^-$ in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 10 and 14 for excluded regions in the parameter space of various 2HDMs. NODE=S055H2D;LINKAGE=CA

[14] AAD 20 combine measurements on H^0 production and decay using data taken in years 2015–2017 (up to 79.8 fb^{-1}) of pp collisions at E_{cm} = 13 TeV. See their Fig. 18 for excluded regions in various 2HDMs. NODE=S055H2D;LINKAGE=X

[15] AAD 20L search for b-associated production of H_2^0 decaying to $b\overline{b}$ in 27.8 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 10 and 11 for excluded regions in the flipped two Higgs doublet model. NODE=S055H2D;LINKAGE=AA

[16] SIRUNYAN 20AA search for $H_2^0 \rightarrow ZA^0$, $A^0 \rightarrow b\overline{b}$ or $A^0 \rightarrow ZH_2^0$, $H_2^0 \rightarrow b\overline{b}$ in 35.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 8 and 9 for excluded regions in the parameter space of Type-II two Higgs doublet model. NODE=S055H2D;LINKAGE=Y

[17] SIRUNYAN 20Y search for gluon-fusion and vector-boson-fusion production of H_2^0 decaying to W^+W^- in the final states $\ell\nu\ell\nu$ and $\ell\nu qq$ in 35.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 7 for excluded regions in Type I and II two Higgs doublet models. NODE=S055H2D;LINKAGE=Z

[18] SIRUNYAN 19AE search for a pseudoscalar resonance produced in association with a $b\overline{b}$ pair, decaying to $\tau^+\tau^-$ in 35.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 4 for cross section limits for m_{A^0} = 25–70 GeV and comparison with some representative 2HDMs. NODE=S055H2D;LINKAGE=V

[19] SIRUNYAN 19AV search for a scalar resonance produced by gluon fusion or b associated production, decaying to $ZH^0 \rightarrow \ell^+\ell^- b\overline{b}$ ($\ell = e$, μ) or $\nu\overline{\nu}b\overline{b}$ in 35.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 6 and 7 for excluded regions in the parameter space of various 2HDMs. NODE=S055H2D;LINKAGE=W

[20] AABOUD 18AH search for production of an A^0 in gluon-gluon fusion and in association with a $b\overline{b}$, decaying to $ZH_2^0 \rightarrow \ell^+\ell^- b\overline{b}$ in 36.1 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 6 for excluded regions in the parameter space of various 2HDMs. NODE=S055H2D;LINKAGE=P

[21] AABOUD 18AI search for production of an A^0 in gluon-gluon fusion and in association with a $b\overline{b}$, decaying to ZH^0 in the final states $\nu\overline{\nu}b\overline{b}$ and $\ell^+\ell^- b\overline{b}$ in 36.1 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 7 and 8 for excluded regions in the parameter space in various 2HDMs. NODE=S055H2D;LINKAGE=O

[22] AABOUD 18BF search for production of a heavy H_2^0 state decaying to ZZ in the final states $\ell^+\ell^-\ell^+\ell^-$ and $\ell^+\ell^-\nu\overline{\nu}$ in 36.1 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 8 and 9 for excluded parameter regions in 2HDM Type I and II. NODE=S055H2D;LINKAGE=R

[23] AABOUD 18CE search for the process $pp \rightarrow H_2^0/A^0\, t\overline{t}$ followed by the decay $H_2^0/A^0 \rightarrow t\overline{t}$ in 36.1 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 12 for limits on cross section times branching ratio, and for lower limits on tanβ for $m_{H_2^0}$, m_{A^0} = 0.4–1.0 TeV in the 2HDM type II. NODE=S055H2D;LINKAGE=U

[24] HALLER 18 perform global fits in the framework of two-Higgs-doublet models (type I, II, lepton specific, flipped). See their Fig. 8 for allowed parameter regions from fits to LHC H^0 measurements, Fig. 9 bottom and charm decays, Fig. 10 muon anomalous magnetic moment, Fig. 11 electroweak precision data, and Fig. 12 by combination of all data. NODE=S055H2D;LINKAGE=S

[25] SIRUNYAN 18BP search for production of $H_2^0/A^0 \rightarrow b\overline{b}$ by b-associated prodution in 35.7 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 6 for the limits on cross section times branching ratio for $m_{H_2^0}$, m_{A^0} = 0.3–1.3 TeV, and Figs. 8 and 9 for excluded regions in the parameter space of type-II and flipped 2HDMs. NODE=S055H2D;LINKAGE=Q

[26] SIRUNYAN 18ED search for production of an A^0 in gluon-gluon fusion and in association with a $b\overline{b}$, decaying to ZH^0 in the final states $\nu\overline{\nu}b\overline{b}$ or $\ell^+\ell^- b\overline{b}$ in 35.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 9 for excluded regions in the parameter space in Type I and II 2HDMs. NODE=S055H2D;LINKAGE=T

[27] AABOUD 17AN search for production of a heavy H_2^0 and/or A^0 decaying to $t\overline{t}$ in 20.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 3 and Table III for excluded parameter regions in Type II Two-Higgs-Doublet-Models. NODE=S055H2D;LINKAGE=M

[28] SIRUNYAN 17AX search for $A^0 b\overline{b}$ production followed by the decay $A^0 \rightarrow \mu^+\mu^-$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV. Limits are set in the range m_{A^0} = 25–60 GeV. See their Fig. 5 for upper limits on $\sigma(A^0 b\overline{b})\cdot$B$(A^0 \rightarrow \mu^+\mu^-)$. NODE=S055H2D;LINKAGE=N

[29] AAD 16AX search for production of a heavy H^0 state decaying to ZZ in the final states $\ell^+\ell^-\ell^+\ell^-$, $\ell^+\ell^-\nu\overline{\nu}$, $\ell^+\ell^- q\overline{q}$, and $\nu\overline{\nu}q\overline{q}$ in 20.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Figs. 13 and 14 for excluded parameter regions in Type I and II models. NODE=S055H2D;LINKAGE=I

[30] KHACHATRYAN 16P search for gluon fusion production of an H_2^0 decaying to $H^0 H^0 \to b\overline{b}\tau^+\tau^-$ and an A^0 decaying to $Z H^0 \to \ell^+\ell^-\tau^+\tau^-$ in 19.7 fb^{-1} of pp collisions at $E_{\rm cm}$ = 8 TeV. See their Fig. 11 for limits on tanβ for m_{A^0} = 230–350 GeV. NODE=S055H2D;LINKAGE=K

[31] KHACHATRYAN 16W search for $A^0 b\overline{b}$ production followed by the decay $A^0 \to \tau^+\tau^-$ in 19.7 fb^{-1} of pp collisions at $E_{\rm cm}$ = 8 TeV. See their Fig. 3 for upper limits on $\sigma(A^0 b\overline{b})\cdot$B$(A^0 \to \tau^+\tau^-)$. NODE=S055H2D;LINKAGE=J

[32] KHACHATRYAN 16Z search for $H_2^0 \to Z A^0$ followed by $A^0 \to b\overline{b}$ or $\tau^+\tau^-$, and $A^0 \to Z H_2^0$ followed by $H_2^0 \to b\overline{b}$ or $\tau^+\tau^-$, in 19.8 fb^{-1} of pp collisions at $E_{\rm cm}$ = 8 TeV. See their Fig. 4 for cross section limits and Fig. 5 for excluded region in the parameter space. NODE=S055H2D;LINKAGE=L

[33] AAD 15BK search for production of a heavy H_2^0 decaying to $H^0 H^0$ in the final state $b\overline{b}b\overline{b}$ in 19.5 fb^{-1} of pp collisions at $E_{\rm cm}$ = 8 TeV. See their Figs. 15–18 for excluded regions in the parameter space. NODE=S055H2D;LINKAGE=H

[34] AAD 15S search for production of A^0 decaying to $Z H^0 \to \ell^+\ell^- b\overline{b}$, $\nu\overline{\nu} b\overline{b}$ and $\ell^+\ell^-\tau^+\tau^-$ in 20.3 fb^{-1} of pp collisions at $E_{\rm cm}$ = 8 TeV. See their Figs. 4 and 5 for excluded regions in the parameter space. NODE=S055H2D;LINKAGE=D

[35] KHACHATRYAN 15BB search for H_2^0 , $A^0 \to \gamma\gamma$ in 19.7 fb^{-1} of pp collisions at $E_{\rm cm}$ = 8 TeV. See their Fig. 10 for excluded regions in the two-Higgs-doublet model parameter space. NODE=S055H2D;LINKAGE=E

[36] KHACHATRYAN 15N search for production of A^0 decaying to $Z H^0 \to \ell^+\ell^- b\overline{b}$ in 19.7 fb^{-1} of pp collisions at $E_{\rm cm}$ = 8 TeV. See their Fig. 5 for excluded regions in the tanβ − cos$(\beta-\alpha)$ plane for m_{A^0} = 300 GeV. NODE=S055H2D;LINKAGE=C

[37] AAD 14M search for the decay cascade $H_2^0 \to H^\pm W^\mp \to H^0 W^\pm W^\mp$, H^0 decaying to $b\overline{b}$ in 20.3 fb^{-1} of pp collisions at $E_{\rm cm}$ = 8 TeV. See their Table IV for limits in a two-Higgs-doublet model for $m_{H_2^0}$= 325–1025 GeV and m_{H^+}= 225–825 GeV. NODE=S055H2D;LINKAGE=A

[38] KHACHATRYAN 14Q search for $H_2^0 \to H^0 H^0$ and $A^0 \to Z H^0$ in 19.5 fb^{-1} of pp collisions at $E_{\rm cm}$ = 8 TeV. See their Figs. 4 and 5 for limits on cross section times branching ratio for m_{H_2,A^0}= 260–360 GeV and their Figs. 7–9 for limits in two-Higgs-doublet models. NODE=S055H2D;LINKAGE=B

[39] AALTONEN 09AR search for Higgs bosons decaying to $\tau^+\tau^-$ in two doublet models in 1.8 fb^{-1} of $p\overline{p}$ collisions at $E_{\rm cm}$ = 1.96 TeV. See their Fig. 2 for the limit on $\sigma\cdot$B$(H_{1,2}^0/A^0 \to \tau^+\tau^-)$ for different Higgs masses, and see their Fig. 3 for the excluded region in the MSSM parameter space. NODE=S055H2D;LINKAGE=TN

[40] ABBIENDI 05A search for $e^+e^- \to H_1^0 A^0$ in general Type-II two-doublet models, with decays H_1^0, $A^0 \to q\overline{q}$, gg, $\tau^+\tau^-$, and $H_1^0 \to A^0 A^0$. NODE=S055H2D;LINKAGE=AN

[41] ABDALLAH 05D search for $e^+e^- \to H^0 Z$ and $H^0 A^0$ with H^0, A^0 decaying to two jets of any flavor including gg. The limit is for SM $H^0 Z$ production cross section with B$(H^0 \to jj)$ = 1. NODE=S055H2D;LINKAGE=AH

[42] ABDALLAH 04O search for $Z \to b\overline{b}H^0$, $b\overline{b}A^0$, $\tau^+\tau^- H^0$ and $\tau^+\tau^- A^0$ in the final states $4b$, $b\overline{b}\tau^+\tau^-$, and 4τ. See paper for limits on Yukawa couplings. NODE=S055H2D;LINKAGE=AO

[43] ABDALLAH 04O search for $e^+e^- \to H^0 Z$ and $H^0 A^0$, with H^0, A^0 decaying to $b\overline{b}$, $\tau^+\tau^-$, or $H^0 \to A^0 A^0$ at $E_{\rm cm}$ = 189–208 GeV. See paper for limits on couplings. NODE=S055H2D;LINKAGE=AP

[44] ABBIENDI 02D search for $Z \to b\overline{b}H_1^0$ and $b\overline{b}A^0$ with $H_1^0/A^0 \to \tau^+\tau^-$, in the range $4<m_H<12$ GeV. See their Fig. 8 for limits on the Yukawa coupling. NODE=S055H2D;LINKAGE=DD

[45] ABBIENDI 01E search for neutral Higgs bosons in general Type-II two-doublet models, at $E_{\rm cm} \le 189$ GeV. In addition to usual final states, the decays H_1^0, $A^0 \to q\overline{q}$, gg are searched for. See their Figs. 15,16 for excluded regions. NODE=S055H2D;LINKAGE=EK

[46] ABBIENDI 99E search for $e^+e^- \to H^0 A^0$ and $H^0 Z$ at $E_{\rm cm}$ = 183 GeV. The limit is with m_H=m_A in general two Higgs-doublet models. See their Fig. 18 for the exclusion limit in the m_H–m_A plane. Updates the results of ACKERSTAFF 98S. NODE=S055H2D;LINKAGE=EB

[47] See Fig. 4 of ABREU 95H for the excluded region in the $m_{H^0} - m_{A^0}$ plane for general two-doublet models. For tanβ >1, the region m_{H^0}+$m_{A^0} \lesssim$ 87 GeV, m_{H^0} <47 GeV is excluded at 95% CL. NODE=S055H2D;LINKAGE=G

[48] PICH 92 analyse H^0 with $m_{H^0} < 2m_\mu$ in general two-doublet models. Excluded regions in the space of mass-mixing angles from LEP, beam dump, and $\pi^\pm$, η rare decays are shown in Figs. 3,4. The considered mass region is not totally excluded. NODE=S055H2D;LINKAGE=F

Mass Limits for H^0 with Vanishing Yukawa Couplings NODE=S055H2F

These limits assume that H^0 couples to gauge bosons with the same strength as the Standard Model Higgs boson, but has no coupling to quarks and leptons (this is often referred to as "fermiophobic"). NODE=S055H2F

VALUE (GeV)	CL%	DOCUMENT ID	TECN	COMMENT

NODE=S055H2F

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

		[1]	AALTONEN	13K	CDF	$H^0 \to WW^{(*)}$
none 100–113	95	[2]	AALTONEN	13L	CDF	$H^0 \to \gamma\gamma$, WW^*, ZZ^*
none 100–116	95	[3]	AALTONEN	13M	TEVA	$H^0 \to \gamma\gamma$, WW^*, ZZ^*
		[4]	ABAZOV	13G	D0	$H^0 \to WW^{(*)}$
none 100–113	95	[5]	ABAZOV	13H	D0	$H^0 \to \gamma\gamma$
		[6]	ABAZOV	13I	D0	$H^0 \to WW^{(*)}$
		[7]	ABAZOV	13J	D0	$H^0 \to WW^{(*)}$, $ZZ^{(*)}$
none 100–114	95	[8]	ABAZOV	13L	D0	$H^0 \to \gamma\gamma$, WW^*, ZZ^*
none 110–147	95	[9]	CHATRCHYAN	13AL	CMS	$H^0 \to \gamma\gamma$
none 110–118, 119.5–121	95	[10]	AAD	12N	ATLS	$H^0 \to \gamma\gamma$
none 100–114	95	[11]	AALTONEN	12AN	CDF	$H^0 \to \gamma\gamma$
none 110–194	95	[12]	CHATRCHYAN	12AO	CMS	$H^0 \to \gamma\gamma$, $WW^{(*)}$, $ZZ^{(*)}$
none 70–106	95	[13]	AALTONEN	09AB	CDF	$H^0 \to \gamma\gamma$
none 70–100	95	[14]	ABAZOV	08U	D0	$H^0 \to \gamma\gamma$
>105.8	95	[15]	SCHAEL	07	ALEP	$e^+e^- \to H^0 Z$, $H^0 \to WW^*$
>104.1	95	[16,17]	ABDALLAH	04L	DLPH	$e^+e^- \to H^0 Z$, $H^0 \to \gamma\gamma$
>107	95	[18]	ACHARD	03C	L3	$H^0 \to WW^*$,ZZ^*, $\gamma\gamma$
>105.5	95	[16,19]	ABBIENDI	02F	OPAL	$H^0 \to \gamma\gamma$
>105.4	95	[20]	ACHARD	02C	L3	$H^0 \to \gamma\gamma$
none 60–82	95	[21]	AFFOLDER	01H	CDF	$p\overline{p} \to H^0 W/Z$, $H^0 \to \gamma\gamma$
> 94.9	95	[22]	ACCIARRI	00S	L3	$e^+e^- \to H^0 Z$, $H^0 \to \gamma\gamma$
>100.7	95	[23]	BARATE	00L	ALEP	$e^+e^- \to H^0 Z$, $H^0 \to \gamma\gamma$
> 96.2	95	[24]	ABBIENDI	99O	OPAL	$e^+e^- \to H^0 Z$, $H^0 \to \gamma\gamma$
> 78.5	95	[25]	ABBOTT	99B	D0	$p\overline{p} \to H^0 W/Z$, $H^0 \to \gamma\gamma$
		[26]	ABREU	99P	DLPH	$e^+e^- \to H^0\gamma$ and/or $H^0 \to \gamma\gamma$

[1] AALTONEN 13K search for $H^0 \to WW^{(*)}$ in 9.7 fb^{-1} of $p\overline{p}$ collisions at $E_{cm} = 1.96$ TeV. A limit on cross section times branching ratio which corresponds to (1.3–6.6) times the expected cross section is given in the range $m_{H^0} = 110$–200 GeV at 95% CL. NODE=S055H2F;LINKAGE=TT

[2] AALTONEN 13L combine all CDF searches with 9.45–10.0 fb^{-1} of $p\overline{p}$ collisions at $E_{cm} = 1.96$ TeV. NODE=S055H2F;LINKAGE=EE

[3] AALTONEN 13M combine all Tevatron data from the CDF and D0 Collaborations of $p\overline{p}$ collisions at $E_{cm} = 1.96$ TeV. NODE=S055H2F;LINKAGE=LL

[4] ABAZOV 13G search for $H^0 \to WW^{(*)}$ in 9.7 fb^{-1} of $p\overline{p}$ collisions at $E_{cm} = 1.96$ TeV. A limit on cross section times branching ratio which corresponds to (2–9) times the expected cross section is given for $m_{H^0} = 100$–200 GeV at 95% CL. NODE=S055H2F;LINKAGE=ZZ

[5] ABAZOV 13H search for $H^0 \to \gamma\gamma$ in 9.6 fb^{-1} of $p\overline{p}$ collisions at $E_{cm} = 1.96$ TeV. NODE=S055H2F;LINKAGE=OO

[6] ABAZOV 13I search for H^0 production in the final state with one lepton and two or more jets plus missing E_T in 9.7 fb^{-1} of $p\overline{p}$ collisions at $E_{cm} = 1.96$ TeV. The search is sensitive to WH^0, ZH^0 and vector-boson fusion Higgs production with $H^0 \to WW^{(*)}$. A limit on cross section times branching ratio which corresponds to (8–30) times the expected cross section is given in the range $m_{H^0} = 100$–200 GeV at 95% CL. NODE=S055H2F;LINKAGE=MM

[7] ABAZOV 13J search for H^0 production in the final states $ee\mu$, $e\mu\mu$, $\mu\tau\tau$, and $e^\pm\mu^\pm$ in 8.6–9.7 fb^{-1} of $p\overline{p}$ collisions at $E_{cm} = 1.96$ TeV. The search is sensitive to WH^0, ZH^0 production with $H^0 \to WW^{(*)}$, $ZZ^{(*)}$, decaying to leptonic final states. A limit on cross section times branching ratio which corresponds to (2.4–13.0) times the expected cross section is given in the range $m_{H^0} = 100$–200 GeV at 95% CL. NODE=S055H2F;LINKAGE=D0

[8] ABAZOV 13L combine all D0 results with up to 9.7 fb^{-1} of $p\overline{p}$ collisions at $E_{cm} = 1.96$ TeV. NODE=S055H2F;LINKAGE=ZC

[9] CHATRCHYAN 13AL search for $H^0 \to \gamma\gamma$ in 5.1 fb^{-1} and 5.3 fb^{-1} of pp collisions at $E_{cm} = 7$ and 8 TeV. NODE=S055H2F;LINKAGE=CY

[10] AAD 12N search for $H^0 \to \gamma\gamma$ with 4.9 fb^{-1} of pp collisions at $E_{cm} = 7$ TeV in the mass range $m_{H^0} = 110$–150 GeV. NODE=S055H2F;LINKAGE=AA

[11] AALTONEN 12AN search for $H^0 \to \gamma\gamma$ with 10 fb^{-1} of $p\overline{p}$ collisions at $E_{cm} = 1.96$ TeV in the mass range $m_{H^0} = 100$–150 GeV. NODE=S055H2F;LINKAGE=FL

[12] CHATRCHYAN 12AO use data from CHATRCHYAN 12G, CHATRCHYAN 12E, CHATRCHYAN 12H, CHATRCHYAN 12I, CHATRCHYAN 12D, and CHATRCHYAN 12C. NODE=S055H2F;LINKAGE=CH

[13] AALTONEN 09AB search for $H^0 \to \gamma\gamma$ in 3.0 fb^{-1} of $p\overline{p}$ collisions at $E_{cm} = 1.96$ TeV in the mass range $m_{H^0} = 70$–150 GeV. Associated $H^0 W$, $H^0 Z$ production and WW, ZZ fusion are considered. NODE=S055H2F;LINKAGE=TO

[14] ABAZOV 08U search for $H^0 \to \gamma\gamma$ in $p\overline{p}$ collisions at $E_{cm} = 1.96$ TeV in the mass range $m_{H^0} = 70$–150 GeV. Associated $H^0 W$, $H^0 Z$ production and WW, ZZ fusion are considered. See their Tab. 1 for the limit on $\sigma \cdot$ B($H^0 \to \gamma\gamma$), and see their Fig. 3 for the excluded region in the m_{H^0} — B($H^0 \to \gamma\gamma$) plane. NODE=S055H2F;LINKAGE=BA

[15] SCHAEL 07 search for Higgs bosons in association with a fermion pair and decaying to $W W^*$. The limit is from this search and HEISTER 02L for a H^0 with SM production cross section. NODE=S055H2F;LINKAGE=SA

[16] Search for associated production of a $\gamma\gamma$ resonance with a Z boson, followed by $Z \to q\overline{q}$, $\ell^+\ell^-$, or $\nu\overline{\nu}$, at $E_{cm} \leq 209$ GeV. The limit is for a H^0 with SM production cross section. NODE=S055H2F;LINKAGE=HA

[17] Updates ABREU 01F. NODE=S055H2F;LINKAGE=HD

[18] ACHARD 03C search for $e^+e^- \to ZH^0$ followed by $H^0 \to WW^*$ or ZZ^* at $E_{cm}=$ 200-209 GeV and combine with the ACHARD 02C result. The limit is for a H^0 with SM production cross section. For B($H^0 \to WW^*$) + B($H^0 \to ZZ^*$) = 1, $m_{H^0} > 108.1$ GeV is obtained. See fig. 6 for the limits under different BR assumptions. NODE=S055H2F;LINKAGE=AC

[19] For B($H^0 \to \gamma\gamma$)=1, m_{H^0} >117 GeV is obtained. NODE=S055H2F;LINKAGE=LA

[20] ACHARD 02C search for associated production of a $\gamma\gamma$ resonance with a Z boson, followed by $Z \to q\overline{q}$, $\ell^+\ell^-$, or $\nu\overline{\nu}$, at $E_{cm} \leq 209$ GeV. The limit is for a H^0 with SM production cross section. For B($H^0 \to \gamma\gamma$)=1, m_{H^0} >114 GeV is obtained. NODE=S055H2F;LINKAGE=HR

[21] AFFOLDER 01H search for associated production of a $\gamma\gamma$ resonance and a W or Z (tagged by two jets, an isolated lepton, or missing E_T). The limit assumes Standard Model values for the production cross section and for the couplings of the H^0 to W and Z bosons. See their Fig. 11 for limits with B($H^0 \to \gamma\gamma$)< 1. NODE=S055H2F;LINKAGE=AF

[22] ACCIARRI 00S search for associated production of a $\gamma\gamma$ resonance with a $q\overline{q}$, $\nu\overline{\nu}$, or $\ell^+\ell^-$ pair in e^+e^- collisions at $E_{cm}=$ 189 GeV. The limit is for a H^0 with SM production cross section. For B($H^0 \to \gamma\gamma$)=1, $m_{H^0} > 98$ GeV is obtained. See their Fig. 5 for limits on B($H \to \gamma\gamma$)$\cdot\sigma$($e^+e^- \to Hf\overline{f}$)/$\sigma$($e^+e^- \to Hf\overline{f}$) (SM). NODE=S055H2F;LINKAGE=PC

[23] BARATE 00L search for associated production of a $\gamma\gamma$ resonance with a $q\overline{q}$, $\nu\overline{\nu}$, or $\ell^+\ell^-$ pair in e^+e^- collisions at $E_{cm}=$ 88–202 GeV. The limit is for a H^0 with SM production cross section. For B($H^0 \to \gamma\gamma$)=1, $m_{H^0} > 109$ GeV is obtained. See their Fig. 3 for limits on B($H \to \gamma\gamma$)$\cdot\sigma$($e^+e^- \to Hf\overline{f}$)/$\sigma$($e^+e^- \to Hf\overline{f}$) (SM). NODE=S055H2F;LINKAGE=PB

[24] ABBIENDI 99O search for associated production of a $\gamma\gamma$ resonance with a $q\overline{q}$, $\nu\overline{\nu}$, or $\ell^+\ell^-$ pair in e^+e^- collisions at 189 GeV. The limit is for a H^0 with SM production cross section. See their Fig. 4 for limits on σ($e^+e^- \to H^0Z^0$)$\times$B($H^0 \to \gamma\gamma$)$\times$B($X^0 \to f\overline{f}$) for various masses. Updates the results of ACKERSTAFF 98Y. NODE=S055H2F;LINKAGE=DI

[25] ABBOTT 99B search for associated production of a $\gamma\gamma$ resonance and a dijet pair. The limit assumes Standard Model values for the production cross section and for the couplings of the H^0 to W and Z bosons. Limits in the range of σ(H^0+Z/W)$\cdot$B($H^0 \to \gamma\gamma$)= 0.80–0.34 pb are obtained in the mass range $m_{H^0}=$ 65–150 GeV. NODE=S055H2F;LINKAGE=3C

[26] ABREU 99P search for $e^+e^- \to H^0\gamma$ with $H^0 \to b\overline{b}$ or $\gamma\gamma$, and $e^+e^- \to H^0q\overline{q}$ with $H^0 \to \gamma\gamma$. See their Fig. 4 for limits on $\sigma\times$B. Explicit limits within an effective interaction framework are also given. NODE=S055H2F;LINKAGE=PA

Mass Limits for H^0 Decaying to Invisible Final States

NODE=S055H2I

These limits are for a neutral scalar H^0 which predominantly decays to invisible final states. Standard Model values are assumed for the couplings of H^0 to ordinary particles unless otherwise stated. NODE=S055H2I

NODE=S055H2I

VALUE (GeV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[1] AABOUD	19AI	ATLS	WW/ZZ fusion
		[2] AAD	15BD	ATLS	$pp \to H^0WX$, H^0ZX
		[3] AAD	15BH	ATLS	jet + missing E_T
		[4] AAD	14BA	ATLS	secondary vertex
		[5] AAD	14O	ATLS	$pp \to H^0ZX$
		[6] CHATRCHYAN	14B	CMS	$pp \to H^0ZX$, qqH^0X
		[7] AAD	13AG	ATLS	secondary vertex
		[8] AAD	13AT	ATLS	electron jets
		[9] CHATRCHYAN	13BJ	CMS	
		[10] AAD	12AQ	ATLS	secondary vertex
		[11] AALTONEN	12AB	CDF	secondary vertex
		[12] AALTONEN	12U	CDF	secondary vertex
>108.2	95	[13] ABBIENDI	10	OPAL	
		[14] ABBIENDI	07	OPAL	large width
>112.3	95	[15] ACHARD	05	L3	
>112.1	95	[15] ABDALLAH	04B	DLPH	
>114.1	95	[15] HEISTER	02	ALEP	$E_{cm} \leq 209$ GeV
>106.4	95	[15] BARATE	01C	ALEP	$E_{cm} \leq 202$ GeV
> 89.2	95	[16] ACCIARRI	00M	L3	

[1] AABOUD 19AI search for $H^0_{1,2}$ production by vector boson fusion and decay to invisible final states in 36.1 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 6(b) for limits on cross section times branching ratios for $m_{H^0_{1,2}}$ = 0.1–3 TeV. NODE=S055H2I;LINKAGE=F

[2] AAD 15BD search for $pp \to H^0 W X$ and $pp \to H^0 Z X$ with W or Z decaying hadronically and H^0 decaying to invisible final states in 20.3 fb^{-1} at E_{cm} = 8TeV. See their Fig. 6 for a limit on the cross section times branching ratio for m_{H^0} = 115–300 GeV. NODE=S055H2I;LINKAGE=D

[3] AAD 15BH search for events with a jet and missing E_T in 20.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV. Limits on $\sigma(H'^0)$ B($H'^0 \to$ invisible) < (44–10) pb (95%CL) is given for $m_{H'^0}$ = 115–300 GeV. NODE=S055H2I;LINKAGE=E

[4] AAD 14BA search for H^0 production in the decay mode $H^0 \to X^0 X^0$, where X^0 is a long-lived particle which decays to collimated pairs of $e^+ e^-$, $\mu^+ \mu^-$, or $\pi^+ \pi^-$ plus invisible particles, in 20.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Figs. 15 and 16 for limits on cross section times branching ratio. NODE=S055H2I;LINKAGE=C

[5] AAD 14O search for $pp \to H^0 Z X$, $Z \to \ell\ell$, with H^0 decaying to invisible final states in 4.5 fb^{-1} at E_{cm} = 7 TeV and 20.3 fb^{-1} at E_{cm} = 8 TeV. See their Fig. 3 for a limit on the cross section times branching ratio for m_{H^0} = 110–400 GeV. NODE=S055H2I;LINKAGE=A

[6] CHATRCHYAN 14B search for $pp \to H^0 Z X$, $Z \to \ell\ell$ and $Z \to b\overline{b}$, and also $pp \to q q H^0 X$ with H^0 decaying to invisible final states using data at E_{cm} = 7 and 8 TeV. See their Figs. 10, 11 for limits on the cross section times branching ratio for m_{H^0} = 100–400 GeV. NODE=S055H2I;LINKAGE=B

[7] AAD 13AG search for H^0 production in the decay mode $H^0 \to X^0 X^0$, where X^0 is a long-lived particle which decays to $\mu^+ \mu^- X'^0$, in 1.9 fb^{-1} of pp collisions at E_{cm} = 7 TeV. See their Fig. 7 for limits on cross section times branching ratio. NODE=S055H2I;LINKAGE=AA

[8] AAD 13AT search for H^0 production in the decay $H^0 \to X^0 X^0$, where X^0 eventually decays to clusters of collimated $e^+ e^-$ pairs, in 2.04 fb^{-1} of pp collisions at E_{cm} = 7 TeV. See their Fig. 3 for limits on cross section times branching ratio. NODE=S055H2I;LINKAGE=DA

[9] CHATRCHYAN 13BJ search for H^0 production in the decay chain $H^0 \to X^0 X^0$, $X^0 \to \mu^+ \mu^- X'^0$ in 5.3 fb^{-1} of pp collisions at E_{cm} = 7 TeV. See their Fig. 2 for limits on cross section times branching ratio. NODE=S055H2I;LINKAGE=AT

[10] AAD 12AQ search for H^0 production in the decay mode $H^0 \to X^0 X^0$, where X^0 is a long-lived particle which decays mainly to $b\overline{b}$ in the muon detector, in 1.94 fb^{-1} of pp collisions at E_{cm} = 7 TeV. See their Fig. 3 for limits on cross section times branching ratio for m_{H^0} = 120, 140 GeV, m_{X^0} = 20, 40 GeV in the $c\tau$ range of 0.5–35 m. NODE=S055H2I;LINKAGE=AD

[11] AALTONEN 12AB search for H^0 production in the decay $H^0 \to X^0 X^0$, where X^0 eventually decays to clusters of collimated $\ell^+ \ell^-$ pairs, in 5.1 fb^{-1} of $p\overline{p}$ collisions at E_{cm} = 1.96 TeV. Cross section limits are provided for a benchmark MSSM model incorporating the parameters given in Table VI. NODE=S055H2I;LINKAGE=AN

[12] AALTONEN 12U search for H^0 production in the decay mode $H^0 \to X^0 X^0$, where X^0 is a long-lived particle with $c\tau \approx$ 1 cm which decays mainly to $b\overline{b}$, in 3.2 fb^{-1} of $p\overline{p}$ collisions at E_{cm} = 1.96 TeV. See their Figs. 9 and 10 for limits on cross section times branching ratio for m_{H^0} = (130–170) GeV, m_{X^0} = 20, 40 GeV. NODE=S055H2I;LINKAGE=AL

[13] ABBIENDI 10 search for $e^+ e^- \to H^0 Z$ with H^0 decaying invisibly. The limit assumes SM production cross section and B($H^0 \to$ invisible) = 1. NODE=S055H2I;LINKAGE=BB

[14] ABBIENDI 07 search for $e^+ e^- \to H^0 Z$ with $Z \to q\overline{q}$ and H^0 decaying to invisible final states. The H^0 width is varied between 1 GeV and 3 TeV. A limit $\sigma \cdot$ B($H^0 \to$ invisible) < (0.07–0.57) pb (95%CL) is obtained at E_{cm} = 206 GeV for m_{H^0} = 60–114 GeV. NODE=S055H2I;LINKAGE=BI

[15] Search for $e^+ e^- \to H^0 Z$ with H^0 decaying invisibly. The limit assumes SM production cross section and B($H^0 \to$ invisible) = 1. NODE=S055H2I;LINKAGE=HM

[16] ACCIARRI 00M search for $e^+ e^- \to Z H^0$ with H^0 decaying invisibly at E_{cm}=183–189 GeV. The limit assumes SM production cross section and B($H^0 \to$ invisible)=1. See their Fig. 6 for limits for smaller branching ratios. NODE=S055H2I;LINKAGE=PD

Mass Limits for Light A^0

NODE=S055H2A

These limits are for a pseudoscalar A^0 in the mass range below $\mathcal{O}$(10) GeV. NODE=S055H2A

NODE=S055H2A

VALUE (GeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
	[1] AAD	25AT	ATLS	$H \to Z A^0$
	[2] ADACHI	23A	BEL2	$\tau \to e A^0$, $\tau \to \mu A^0$
	[3] TUMASYAN	23AR	CMS	$H \to A^0 A^0 \to 4\gamma$
	[4] ABLIKIM	22H	BES3	$J/\psi \to A^0 \gamma$
	[5] JIA	22	BELL	$\Upsilon(1S) \to A^0 \gamma$
	[6] AAD	20AE	ATLS	$H^0 \to Z A^0$
	[7] AABOUD	18AP	ATLS	$H^0 \to A^0 A^0$
	[8] KHACHATRY...	17AZ	CMS	$H^0 \to A^0 A^0$
	[9] ABLIKIM	16E	BES3	$J/\psi \to A^0 \gamma$
	[10] KHACHATRY...	16F	CMS	$H^0 \to A^0 A^0$
	[11] LEES	15H	BABR	$\Upsilon(1S) \to A^0 \gamma$

[12]	LEES	13C	BABR	$\Upsilon(1S) \to A^0\gamma$	
[13]	LEES	13L	BABR	$\Upsilon(1S) \to A^0\gamma$	
[14]	LEES	13R	BABR	$\Upsilon(1S) \to A^0\gamma$	
[15]	ABLIKIM	12	BES3	$J/\psi \to A^0\gamma$	
[16]	CHATRCHYAN	12V	CMS	$A^0 \to \mu^+\mu^-$	
[17]	AALTONEN	11P	CDF	$t \to bH^+$, $H^+ \to W^+A^0$	
[18,19]	ABOUZAID	11A	KTEV	$K_L \to \pi^0\pi^0A^0$, $A^0 \to \mu^+\mu^-$	
[20]	DEL-AMO-SA...	11J	BABR	$\Upsilon(1S) \to A^0\gamma$	
[21]	LEES	11H	BABR	$\Upsilon(2S, 3S) \to A^0\gamma$	
[22]	ANDREAS	10	RVUE		
[19,23]	HYUN	10	BELL	$B^0 \to K^{*0}A^0$, $A^0 \to \mu^+\mu^-$	
[19,24]	HYUN	10	BELL	$B^0 \to \rho^0A^0$, $A^0 \to \mu^+\mu^-$	OCCUR=2
[25]	AUBERT	09P	BABR	$\Upsilon(3S) \to A^0\gamma$	
[26]	AUBERT	09Z	BABR	$\Upsilon(2S) \to A^0\gamma$	
[27]	AUBERT	09Z	BABR	$\Upsilon(3S) \to A^0\gamma$	OCCUR=2
[19,28]	TUNG	09	K391	$K_L \to \pi^0\pi^0A^0$, $A^0 \to \gamma\gamma$	
[29]	LOVE	08	CLEO	$\Upsilon(1S) \to A^0\gamma$	
[30]	BESSON	07	CLEO	$\Upsilon(1S) \to \eta_b\gamma$	
[31]	PARK	05	HYCP	$\Sigma^+ \to pA^0$, $A^0 \to \mu^+\mu^-$	
[32]	BALEST	95	CLE2	$\Upsilon(1S) \to A^0\gamma$	
[33]	ANTREASYAN	90C	CBAL	$\Upsilon(1S) \to A^0\gamma$	

[1] AAD 25AT search for the decay $H \to ZA^0$, $Z \to \ell^+\ell^-$, A^0 decaying hadronically (gg or $q\overline{q}$), in 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 4 for limits on B($H \to ZA^0$) with assumptions B($A^0 \to gg$) = 1 for m_{A^0} = 0.5–3.5 GeV, or B($A^0 \to q\overline{q}$) = 1 for m_{A^0} = 1.5–3.5 GeV. Supersedes AAD 20AE. NODE=S055H2A;LINKAGE=S

[2] ADACHI 23A search for flavor-changing τ decays $\tau \to eA^0$ and $\tau \to \mu A^0$, with A^0 invisible, using 62.8 fb^{-1} of e^+e^- collisions at E_{cm} = 10.58 GeV. Limits on B($\tau \to eA^0$)/B($\tau \to e\nu\nu$) in the range 1.1×10^{-3}–9.7×10^{-3} (95% CL) and B($\tau \to \mu A^0$)/B($\tau \to \mu\nu\nu$) in the range 0.7×10^{-3}–12.2×10^{-3} (95% CL) are given for m_{A^0} = 0–1.6 GeV. See their Fig. 2. NODE=S055H2A;LINKAGE=Q

[3] TUMASYAN 23AR search for the decay $H \to A^0A^0$ with $A^0 \to \gamma\gamma$ (detected as a merged photonlike object) using 136 fb^{-1} of pp collisions at E_{cm} = 13 TeV. Limits on B($H \to A^0A^0$)·B^2($A^0 \to \gamma\gamma$) in the range 0.9×10^{-3}–3.3×10^{-3} (95% CL) are given for m_{A^0} = 0.1–1.2 GeV. See their Fig. 2. NODE=S055H2A;LINKAGE=R

[4] ABLIKIM 22H search for the process $J/\psi \to A^0\gamma$ with A^0 decaying to $\mu^+\mu^-$ in 9×10^9 J/ψ events and give limits on B($J/\psi \to A^0\gamma$)·B($A^0 \to \mu^+\mu^-$) in the range 1.2×10^{-9}–7.78×10^{-7} (90% CL) for 0.212 GeV $\leq m_{A^0} \leq$ 3.0 GeV. See their Fig. 4. NODE=S055H2A;LINKAGE=O

[5] JIA 22 search for the process $\Upsilon(2S) \to \Upsilon(1S)\pi^+\pi^- \to A^0\gamma\pi^+\pi^-$ with A^0 decaying to $\tau^+\tau^-$ or $\mu^+\mu^-$ in 158×10^6 $\Upsilon(2S)$ events and give limits on B($\Upsilon(1S) \to A^0\gamma$)·B($A^0 \to \tau^+\tau^-$) in the range 3.8×10^{-6}–1.5×10^{-4} (90% CL) for m_{A^0} = 3.6–9.2 GeV, and B($\Upsilon(1S) \to A^0\gamma$)·B($A^0 \to \mu^+\mu^-$) in the range 3.1×10^{-7}–1.6×10^{-5} (90% CL) for m_{A^0} = 0.21–9.2 GeV. See their Fig. 4. NODE=S055H2A;LINKAGE=P

[6] AAD 20AE search for the decay $H^0 \to ZA^0$, $Z \to \ell^+\ell^-$, A^0 decaying hadronically ($A^0 \to gg$ or $s\overline{s}$), in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. Limit on the product of production cross section and the $H^0 \to ZA^0$ branching ratio in the range 17–340 pb (95% CL) is given for m_{A^0} = 0.5–4.0 GeV, see their Table I. NODE=S055H2A;LINKAGE=N

[7] AABOUD 18AP search for the decay $H^0 \to A^0A^0 \to \mu^+\mu^-\mu^+\mu^-$ in 36.1 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 10(b) for limits on B($H^0 \to A^0A^0$) in the range m_{A^0} = 1–2.5, 4.5–8 GeV, assuming a type-II two-doublet plus singlet model with tan(β) = 5. NODE=S055H2A;LINKAGE=M

[8] KHACHATRYAN 17AZ search for the decay $H^0 \to A^0A^0 \to \tau^+\tau^-\tau^+\tau^-$, $\mu^+\mu^-b\overline{b}$, and $\mu^+\mu^-\tau^+\tau^-$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Figs. 4, 5, and 6 for cross section limits in the range m_{A^0} = 5–62.5 GeV. See also their Figs. 7, 8, and 9 for interpretation of the data in terms of models with two Higgs doublets and a singlet. NODE=S055H2A;LINKAGE=K

[9] ABLIKIM 16E search for the process $J/\psi \to A^0\gamma$ with A^0 decaying to $\mu^+\mu^-$ and give limits on B($J/\psi \to A^0\gamma$)·B($A^0 \to \mu^+\mu^-$) in the range 2.8×10^{-8}–5.0×10^{-6} (90% CL) for 0.212 $\leq m_{A^0} \leq$ 3.0 GeV. See their Fig. 5. NODE=S055H2A;LINKAGE=I

[10] KHACHATRYAN 16F search for the decay $H^0 \to A^0A^0 \to \tau^+\tau^-\tau^+\tau^-$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 8 for cross section limits for m_{A^0} = 4–8 GeV. NODE=S055H2A;LINKAGE=H

[11] LEES 15H search for the process $\Upsilon(2S) \to \Upsilon(1S)\pi^+\pi^- \to A^0\gamma\pi^+\pi^-$ with A^0 decaying to $c\overline{c}$ and give limits on B($\Upsilon(1S) \to A^0\gamma$)·B($A^0 \to c\overline{c}$) in the range 7.4×10^{-5}–2.4×10^{-3} (90% CL) for 4.00 $\leq m_{A^0} \leq$ 8.95 and 9.10 $\leq m_{A^0} \leq$ 9.25 GeV. See their Fig. 6. NODE=S055H2A;LINKAGE=B

[12] LEES 13C search for the process $\Upsilon(2S, 3S) \rightarrow \Upsilon(1S)\pi^+\pi^- \rightarrow A^0\gamma\pi^+\pi^-$ with A^0 decaying to $\mu^+\mu^-$ and give limits on $B(\Upsilon(1S) \rightarrow A^0\gamma)\cdot B(A^0 \rightarrow \mu^+\mu^-)$ in the range $(0.3–9.7) \times 10^{-6}$ (90% CL) for $0.212 \le m_{A^0} \le 9.20$ GeV. See their Fig. 5(e) for limits on the $b-A^0$ Yukawa coupling derived by combining this result with AUBERT 09Z. NODE=S055H2A;LINKAGE=LE

[13] LEES 13L search for the process $\Upsilon(2S) \rightarrow \Upsilon(1S)\pi^+\pi^- \rightarrow A^0\gamma\pi^+\pi^-$ with A^0 decaying to gg or $s\overline{s}$ and give limits on $B(\Upsilon(1S) \rightarrow A^0\gamma)\cdot B(A^0 \rightarrow gg)$ between 1×10^{-6} and 2×10^{-2} (90% CL) for $0.5 \le m_{A^0} \le 9.0$ GeV, and $B(\Upsilon(1S) \rightarrow A^0\gamma)\cdot B(A^0 \rightarrow s\overline{s})$ between 4×10^{-6} and 1×10^{-3} (90%CL) for $1.5 \le m_{A^0} \le 9.0$ GeV. See their Fig. 4. NODE=S055H2A;LINKAGE=E

[14] LEES 13R search for the process $\Upsilon(2S) \rightarrow \Upsilon(1S)\pi^+\pi^- \rightarrow A^0\gamma\pi^+\pi^-$ with A^0 decaying to $\tau^+\tau^-$ and give limits on $B(\Upsilon(1S) \rightarrow A^0\gamma)\cdot B(A^0 \rightarrow \tau^+\tau^-)$ in the range $0.9–13 \times 10^{-5}$ (90% CL) for $3.6 \le m_{A^0} \le 9.2$ GeV. See their Fig. 4 for limits on the $b-A^0$ Yukawa coupling derived by combining this result with AUBERT 09P. NODE=S055H2A;LINKAGE=F

[15] ABLIKIM 12 searches for the process $\psi(3686) \rightarrow \pi\pi J/\psi$, $J/\psi \rightarrow A^0\gamma$ with A^0 decaying to $\mu^+\mu^-$. It gives mass dependent limits on $B(J/\psi \rightarrow A^0\gamma)\cdot B(A^0 \rightarrow \mu^+\mu^-)$ in the range $4 \times 10^{-7}–2.1 \times 10^{-5}$ (90% C.L.) for $0.212 \le m_{A^0} \le 3.0$ GeV. See their Fig. 2. NODE=S055H2A;LINKAGE=J

[16] CHATRCHYAN 12V search for A^0 production in the decay $A^0 \rightarrow \mu^+\mu^-$ with 1.3 fb^{-1} of pp collisions at $E_{cm} = 7$ TeV. A limit on $\sigma(A^0)\cdot B(A^0 \rightarrow \mu^+\mu^-)$ in the range (1.5–7.5) pb is given for $m_{A^0} = (5.5–8.7)$ and (11.5–14) GeV at 95% CL. NODE=S055H2A;LINKAGE=CA

[17] AALTONEN 11P search in 2.7 fb^{-1} of $p\overline{p}$ collisions at $E_{cm} = 1.96$ TeV for the decay chain $t \rightarrow bH^+$, $H^+ \rightarrow W^+A^0$, $A^0 \rightarrow \tau^+\tau^-$ with m_{A^0} between 4 and 9 GeV. See their Fig. 4 for limits on $B(t \rightarrow bH^+)$ for $90 < m_{H^+} < 160$ GeV. NODE=S055H2A;LINKAGE=A5

[18] ABOUZAID 11A search for the decay chain $K_L \rightarrow \pi^0\pi^0A^0$, $A^0 \rightarrow \mu^+\mu^-$ and give a limit $B(K_L \rightarrow \pi^0\pi^0A^0) \cdot B(A^0 \rightarrow \mu^+\mu^-) < 1.0 \times 10^{-10}$ at 90% CL for $m_{A^0} =$ 214.3 MeV. NODE=S055H2A;LINKAGE=AB

[19] The search was motivated by PARK 05. NODE=S055H2A;LINKAGE=PA

[20] DEL-AMO-SANCHEZ 11J search for the process $\Upsilon(2S) \rightarrow \Upsilon(1S)\pi^+\pi^- \rightarrow A^0\gamma\pi^+\pi^-$ with A^0 decaying to invisible final states. They give limits on $B(\Upsilon(1S) \rightarrow A^0\gamma)\cdot B(A^0 \rightarrow \text{invisible})$ in the range $(1.9–4.5) \times 10^{-6}$ (90% CL) for $0 \le m_{A^0} \le$ 8.0 GeV, and $(2.7–37) \times 10^{-6}$ for $8.0 \le m_{A^0} \le 9.2$ GeV. NODE=S055H2A;LINKAGE=D1

[21] LEES 11H search for the process $\Upsilon(2S, 3S) \rightarrow A^0\gamma$ with A^0 decaying hadronically and give limits on $B(\Upsilon(2S, 3S) \rightarrow A^0\gamma)\cdot B(A^0 \rightarrow \text{hadrons})$ in the range $1 \times 10^{-6}–8 \times 10^{-5}$ (90% CL) for $0.3 < m_{A^0} < 7$ GeV. The decay rates for $\Upsilon(2S)$ and $\Upsilon(3S)$ are assumed to be equal up to the phase space factor. See their Fig. 5. NODE=S055H2A;LINKAGE=L1

[22] ANDREAS 10 analyze constraints from rare decays and other processes on a light A^0 with $m_{A^0} < 2m_\mu$ and give limits on its coupling to fermions at the level of 10^{-4} times the Standard Model value. NODE=S055H2A;LINKAGE=AN

[23] HYUN 10 search for the decay chain $B^0 \rightarrow K^{*0}A^0$, $A^0 \rightarrow \mu^+\mu^-$ and give a limit on $B(B^0 \rightarrow K^{*0}A^0) \cdot B(A^0 \rightarrow \mu^+\mu^-)$ in the range $(2.26–5.53) \times 10^{-8}$ at 90%CL for $m_{A^0} = 212–300$ MeV. The limit for $m_{A^0} = 214.3$ MeV is 2.26×10^{-8}. NODE=S055H2A;LINKAGE=HY

[24] HYUN 10 search for the decay chain $B^0 \rightarrow \rho^0A^0$, $A^0 \rightarrow \mu^+\mu^-$ and give a limit on $B(B^0 \rightarrow \rho^0A^0) \cdot B(A^0 \rightarrow \mu^+\mu^-)$ in the range $(1.73–4.51) \times 10^{-8}$ at 90%CL for $m_{A^0} = 212–300$ MeV. The limit for $m_{A^0} = 214.3$ MeV is 1.73×10^{-8}. NODE=S055H2A;LINKAGE=HU

[25] AUBERT 09P search for the process $\Upsilon(3S) \rightarrow A^0\gamma$ with $A^0 \rightarrow \tau^+\tau^-$ for $4.03 < m_{A^0} < 9.52$ and $9.61 < m_{A^0} < 10.10$ GeV, and give limits on $B(\Upsilon(3S) \rightarrow A^0\gamma)\cdot B(A^0 \rightarrow \tau^+\tau^-)$ in the range $(1.5–16) \times 10^{-5}$ (90% CL). NODE=S055H2A;LINKAGE=BR

[26] AUBERT 09Z search for the process $\Upsilon(2S) \rightarrow A^0\gamma$ with $A^0 \rightarrow \mu^+\mu^-$ for $0.212 < m_{A^0} < 9.3$ GeV and give limits on $B(\Upsilon(2S) \rightarrow A^0\gamma)\cdot B(A^0 \rightarrow \mu^+\mu^-)$ in the range $(0.3–8) \times 10^{-6}$ (90% CL). NODE=S055H2A;LINKAGE=UB

[27] AUBERT 09Z search for the process $\Upsilon(3S) \rightarrow A^0\gamma$ with $A^0 \rightarrow \mu^+\mu^-$ for $0.212 < m_{A^0} < 9.3$ GeV and give limits on $B(\Upsilon(3S) \rightarrow A^0\gamma)\cdot B(A^0 \rightarrow \mu^+\mu^-)$ in the range $(0.3–5) \times 10^{-6}$ (90% CL). NODE=S055H2A;LINKAGE=AU

[28] TUNG 09 search for the decay chain $K_L \rightarrow \pi^0\pi^0A^0$, $A^0 \rightarrow \gamma\gamma$ and give a limit on $B(K_L \rightarrow \pi^0\pi^0A^0) \cdot B(A^0 \rightarrow \gamma\gamma)$ in the range $(2.4–10.7) \times 10^{-7}$ at 90%CL for $m_{A^0} = 194.3–219.3$ MeV. The limit for $m_{A^0} = 214.3$ MeV is 2.4×10^{-7}. NODE=S055H2A;LINKAGE=NG

[29] LOVE 08 search for the process $\Upsilon(1S) \rightarrow A^0\gamma$ with $A^0 \rightarrow \mu^+\mu^-$ (for $m_{A^0} < 2m_\tau$) and $A^0 \rightarrow \tau^+\tau^-$. Limits on $B(\Upsilon(1S) \rightarrow A^0\gamma) \cdot B(A^0 \rightarrow \ell^+\ell^-)$ in the range $10^{-6}–10^{-4}$ (90% CL) are given. NODE=S055H2A;LINKAGE=LO

[30] BESSON 07 give a limit $B(\Upsilon(1S) \rightarrow \eta_b\gamma) \cdot B(\eta_b \rightarrow \tau^+\tau^-) < 0.27\%$ (95% CL), which constrains a possible A^0 exchange contribution to the η_b decay. NODE=S055H2A;LINKAGE=BE

[31] PARK 05 found three candidate events for $\Sigma^+ \rightarrow p\mu^+\mu^-$ in the HyperCP experiment. Due to a narrow spread in dimuon mass, they hypothesize the events as a possible signal NODE=S055H2A;LINKAGE=H5

of a new boson. It can be interpreted as a neutral particle with $m_{A^0} = 214.3 \pm 0.5$ MeV and the branching fraction $B(\Sigma^+ \to p A^0) \cdot B(A^0 \to \mu^+ \mu^-) = (3.1^{+2.4}_{-1.9} \pm 1.5) \times 10^{-8}$.

[32] BALEST 95 give limits $B(\Upsilon(1S) \to A^0 \gamma)$ ¡ 1.5×10^{-5} at 90% CL for $m_{A^0} < 5$ GeV. The limit becomes $< 10^{-4}$ for $m_{A^0} < 7.7$ GeV. NODE=S055H2A;LINKAGE=D

[33] ANTREASYAN 90C give limits $B(\Upsilon(1S) \to A^0 \gamma)$ ¡ 5.6×10^{-5} at 90% CL for $m_{A^0} <$ 7.2 GeV. A^0 is assumed not to decay in the detector. NODE=S055H2A;LINKAGE=G

Other Mass Limits

NODE=S055H2O

We use a symbol H_1^0 if mass < 125 GeV or H_2^0 if mass > 125 GeV. The notation H is reserved for the 125 GeV particle.

NODE=S055H2O

NODE=S055H2O

VALUE (GeV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
		[1] AAD	25AL	ATLS	$t\bar{t}H_2^0/A^0$	
		[2] AAD	25AN	ATLS	$t\bar{t}A^0$, $A^0 \to b\bar{b}$	
		[3] AAD	25AU	ATLS	$H \to A^0 A^0$	
		[4] AAD	25AW	ATLS	$H \to A^0 A^0$	
		[5] AAD	25AW	ATLS	$H \to A_1^0 A_2^0$	OCCUR=2
		[6] AAD	25AY	ATLS	$H \to H_1^0 H_1^0$	
		[7] AAD	25F	ATLS	$H_{1/2}^0 \to Z' Z'$, $Z' \to \ell^+ \ell^-$	
		[8] AAD	25J	ATLS	$H_3^0 \to H_2^0 H$, $H_2^0 \to HH$	
		[9] AAD	25O	ATLS	$H_1^0 \to \gamma\gamma$	
		[10] AAD	25X	ATLS	$H \to A^0 A^0$	
		[11] ADAN	25		$H \to A^0 A^0$	
		[12] CHEKHOVSKY	25C	CMS	$H_2^0/A^0 \to b\bar{b}$	
		[13] CHEKHOVSKY	25D	CMS	$H_{1/2}^0/A^0 \to$ invisible	
		[14] CHEKHOVSKY	25I	CMS	$A^0 \to ZH$	
		[15] CHEKHOVSKY	25J	CMS	$A_2^0 \to H A_1^0$	
		[16] CORTINA-GIL	25B	NA62	$K^+ \to \pi^+ H_1^0$	
		[17] HAYRAPETY...	25A	CMS	$H_1^0 \to \gamma\gamma$	
		[18] HAYRAPETY...	25AP	CMS	$H_3^0 \to H H_{1/2}^0$	
		[19] HAYRAPETY...	25C	CMS	$H_3^0 \to H_1^0 H_1^0$	
		[20] HAYRAPETY...	25I	CMS	$A^0 \to Z H_2^0$, $H_2^0 \to t\bar{t}$	
		[21] HAYRAPETY...	25P	CMS	$b\bar{b}A^0$, $A^0 \to$ invisible	
		[22] AAD	24A	ATLS	$H_2^0 \to Z\gamma$	
		[23] AAD	24AP	ATLS	H_2^0, $A^0 \to t\bar{t}$	
		[24] AAD	24BQ	ATLS	$H \to A^0 A^0$	
		[25] AAD	24BV	ATLS	$H_2^0 \to HH$	
		[26] AAD	24BW	ATLS	$H_3^0 \to H_2^0 H$	
		[27] AAD	24BX	ATLS	$H_4^0 \to H_2^0 H_3^0$	
		[28] AAD	24BX	ATLS	$A^0 \to H_2^0 Z$	OCCUR=2
		[29] AAD	24CA	ATLS	$H_3^0 \to H_{1,2}^0 H$	
		[30] AAD	24CD	ATLS	$H_2^0 \to ZA$	
		[31] AAD	24CF	ATLS	$A^0 \to \tau^+\tau^-$	
		[32] AAD	24CI	ATLS	H_2^0, $A^0 \to$ invisible	
		[33] AAD	24CK	ATLS	two doublet + pseudoscalar + Dirac DM	
		[34] AAD	24H	ATLS	$H_2^0 \to HH$	
		[35] AAD	24K	ATLS	$H \to ZA^0$	
		[36] ADACHI	24F	BEL2	$H_1^0 \to \mu^+\mu^-$	
		[37] HAYRAPETY...	24AA	CMS	$H \to A^0 A^0$	
		[38] HAYRAPETY...	24AE	CMS	$H_2^0 \to HH$	
		[39] HAYRAPETY...	24AF	CMS	$H \to A^0 A^0$	
		[40] HAYRAPETY...	24AI	CMS	$H \to H_1^0 H_1^0$, long-lived	
		[41] HAYRAPETY...	24AJ	CMS	$H_2^0 \to \gamma\gamma$	
		[42] HAYRAPETY...	24AZ	CMS	$A^0 A^0$, $A^0 \to \mu^+\mu^-$	
		[43] HAYRAPETY...	24AZ	CMS	H, $H_{1,2}^0 \to A^0 A^0$, $A^0 \to \mu^+\mu^-$	OCCUR=2
		[44] HAYRAPETY...	24I	CMS	$H \to ZA^0$	
		[45] TUMASYAN	24A	CMS	$H_{1,2}^0 \to e^+e^-$, $\mu^+\mu^-$, $\tau^+\tau^-$	
		[46] TUMASYAN	24B	CMS	$H_2^0 \to HH$	

47	TUMASYAN	24B	CMS	$H_3^0 \to H_{1,2}^0 H$	OCCUR=2
48	AAD	23AD	ATLS	$H_2^0 \to H H$	
49	AAD	23AD	ATLS	$A^0 \to Z H_2^0 \to Z H H$	OCCUR=2
50	AAD	23AJ	ATLS	$H^{\pm} \to W^{\pm} A^0$	
51	AAD	23BD	ATLS	$t \to q H_{1,2}^0$	
52	AAD	23BE	ATLS	$H_2^0 \to W^+ W^-$	
53	AAD	23BG	ATLS	$t \overline{t} H_2^0/A^0$	
54	AAD	23BW	ATLS	$A^0 t \overline{t}$, $A^0 \to \mu^+ \mu^-$	
55	AAD	23BX	ATLS	H + invisible A^0	
56	AAD	23CA	ATLS	$H_3^0 \to H_2^0 H$	
57	AAD	23CR	ATLS	flavor changing H_2^0	
58	AAD	23O	ATLS	$A^0 \to Z H$	
59	AAD	23R	ATLS	$A^0 \to \gamma\gamma$	
60	AAD	23U	ATLS	$H_2^0 \to Z \gamma$	
61	AAD	23Z	ATLS	$H_2^0 \to H H$	
62	HAYRAPETY...	23C	CMS	$H_{1,2}^0 \to e \mu$	
63	HAYRAPETY...	23G	CMS	$A^0 \to \mu^+ \mu^-$	
64	TUMASYAN	23	CMS	$H_3^0 \to H_{1,2}^0 H$	
65	TUMASYAN	23M	CMS	$H \to A^0 A^0$	
66	TUMASYAN	23O	CMS	$H_2^0 \to H H$	
67	TUMASYAN	23S	CMS	$H_{1,2}^0 \to \tau^+ \tau^-$	
68	AAD	22A	ATLS	$H \to A^0 A^0$	
69	AAD	22D	ATLS	$Z A^0$, $A^0 \to$ invisible	
70	AAD	22F	ATLS	$H_2^0 \to H H$	
71	AAD	22I	ATLS	$H \to \widetilde{\chi}_2^0 \widetilde{\chi}_1^0$, $\widetilde{\chi}_2^0 \to A^0 \widetilde{\chi}_1^0$, $A^0 \to b \overline{b}$	
72	AAD	22J	ATLS	$H \to Z A^0$	
73	AAD	22J	ATLS	$H \to A^0 A^0$, $H_1^0 H_1^0$	OCCUR=2
74	AAD	22P	ATLS	H_1^0, $H_2^0 \to$ invisible	
75	AAD	22Y	ATLS	$H_2^0 \to H H$	
76	ABRATENKO	22A	MCBN	$K^+ \to H_1^0 \pi^+$	
77	TUMASYAN	22AK	CMS	$H_3^0 \to H_1^0 H_1^0$	
78	TUMASYAN	22D	CMS	$H_2^0 \to W^+ W^-$	
79	AAD	21AF	ATLS	$H_2^0 \to Z Z$	
80	AAD	21AI	ATLS	$A^0 \to Z H_2^0$	
81	AAD	21AY	ATLS	$H_2^0 \to \gamma\gamma$	
82	AAD	21AZ	ATLS	$A_2^0 \to H A_1^0$	
83	AAD	21BB	ATLS	$A_2^0 \to H A_1^0$	
84	AAD	21BE	ATLS	$A_1^0 \to$ invisible	
85	ABRATENKO	21	MCBN	$K^+ \to H_1^0 \pi^+$	
86	SIRUNYAN	21A	CMS	$H_2^0 \to Z A^0$, $A^0 \to$ invisible	
87	TUMASYAN	21F	CMS	$H_3^0 \to H H_{1,2}^0$	
88	AAD	20AA	ATLS	$H_2^0/A^0 \to \tau^+ \tau^-$	
89	AAD	20AI	ATLS	$H \to A^0 A^0$	
90	AAD	20AO	ATLS	$H_2^0 \to H H$	
91	AAD	20C	ATLS	$H_2^0 \to H H$	
92	AAD	20L	ATLS	$H_2^0 \to b \overline{b}$	
93	AAD	20X	ATLS	$H_2^0 \to H H$	
94	AAIJ	20AL	LHCB	$A^0 \to \mu^+ \mu^-$	
95	SIRUNYAN	20	CMS	$H \to A^0 A^0$	
96	SIRUNYAN	20AA	CMS	$H_2^0 \to Z A^0$ or $A^0 \to Z H_2^0$	
97	SIRUNYAN	20AC	CMS	$A^0 \to Z H$	
98	SIRUNYAN	20AD	CMS	$H_2^0 \to \mu\tau$, $e\tau$	
99	SIRUNYAN	20AF	CMS	$H_2^0/A^0 \to t \overline{t}$	
100	SIRUNYAN	20AP	CMS	H, $H_2^0 \to A^0 A^0$	
101	SIRUNYAN	20Y	CMS	$H_2^0 \to W^+ W^-$	
102	SIRUNYAN	20Z	CMS	$t \overline{t} H_{1,2}^0$ or $t \overline{t} A^0$, $H_{1,2}^0/A^0 \to e^+ e^-$, $\mu^+ \mu^-$	
103	AABOUD	19A	ATLS	$H_2^0 \to H H$	

104	AABOUD	19AG	ATLS	$H \to A^0 A^0$	
105	AABOUD	19O	ATLS	$H_2^0 \to H H$	
106	AABOUD	19T	ATLS	$H_2^0 \to H H$	OCCUR=2
107	AABOUD	19V	ATLS	two doublet + pseudoscalar model	OCCUR=2
108	AABOUD	19Y	ATLS	$H_2^0 \to \mu^+ \mu^-$	
109	AALTONEN	19	CDF	$H_{1,2}^0 \to b\overline{b}$	
110	SIRUNYAN	19	CMS	$H_2^0 \to H H$	
111	SIRUNYAN	19AE	CMS	$A^0 \to \tau^+ \tau^-$	
112	SIRUNYAN	19AN	CMS	$A_2^0 \to H A_1^0$	
113	SIRUNYAN	19AV	CMS	$A^0 \to Z H$	
114	SIRUNYAN	19B	CMS	$H_{1,2}^0 / A^0 \to b\overline{b}$	
115	SIRUNYAN	19BB	CMS	$H_1^0 \to \gamma\gamma$	
116	SIRUNYAN	19BD	CMS	$H \to A^0 A^0$	
117	SIRUNYAN	19BE	CMS	$H_2^0 \to H H$	
118	SIRUNYAN	19BQ	CMS	$H_{1,2}^0 \to A^0 A^0$	
119	SIRUNYAN	19CR	CMS	$H_2^0 / A^0 \to \mu^+ \mu^-$	
120	SIRUNYAN	19H	CMS	$H_2^0 \to H H$	
121	AABOUD	18AA	ATLS	$H_2^0 \to Z \gamma$	
122	AABOUD	18AG	ATLS	$H \to A^0 A^0$	
123	AABOUD	18AH	ATLS	$A^0 \to Z H_2^0$	
124	AABOUD	18AI	ATLS	$A^0 \to Z H$	
125	AABOUD	18BF	ATLS	$H_2^0 \to Z Z$	
126	AABOUD	18BU	ATLS	$H_2^0 \to H H$	
127	AABOUD	18BX	ATLS	$H \to A^0 A^0$	
128	AABOUD	18CQ	ATLS	$H_2^0 \to H H$	
129	AABOUD	18F	ATLS	$H_2^0 \to W^+ W^-$, $Z Z$	
130	AAIJ	18AM	LHCB	$H_{1,2}^0 \to \mu \tau$	
131	AAIJ	18AQ	LHCB	$A^0 \to \mu^+ \mu^-$	
132	AAIJ	18AQ	LHCB	$H \to A^0 A^0$, $A^0 \to \mu^+ \mu^-$	OCCUR=2
133	SIRUNYAN	18AF	CMS	$H_2^0 \to H H$	
134	SIRUNYAN	18BA	CMS	$H_2^0 \to Z Z$	
135	SIRUNYAN	18CW	CMS	$H_2^0 \to H H$	
136	SIRUNYAN	18DK	CMS	$H_2^0 \to Z \gamma$	
137	SIRUNYAN	18DT	CMS	$H \to A^0 A^0$	
138	SIRUNYAN	18DU	CMS	$H_2^0 \to \gamma\gamma$	
139	SIRUNYAN	18ED	CMS	$A^0 \to Z H$	
140	SIRUNYAN	18EE	CMS	$H \to A^0 A^0$	
141	SIRUNYAN	18F	CMS	$p p$, 13 TeV, $H_2^0 \to H H$	
142	AABOUD	17	ATLS	$H_2^0 \to Z \gamma$	
143	AABOUD	17AP	ATLS	$H_2^0 \to \gamma\gamma$	
144	AABOUD	17AW	ATLS	$H_2^0 \to Z \gamma$	
145	KHACHATRY...	17AZ	CMS	$H \to A^0 A^0$	
146	KHACHATRY...	17D	CMS	$p p$, 8, 13 TeV, $H_2^0 \to Z \gamma$	
147	KHACHATRY...	17R	CMS	$H_2^0 \to \gamma\gamma$	
148	SIRUNYAN	17CN	CMS	$p p$, 8 TeV, $H_2^0 \to H H$	
149	SIRUNYAN	17Y	CMS	$p p$, 8, 13 TeV, $H_2^0 \to Z \gamma$	
150	AABOUD	16AB	ATLS	$H \to A^0 A^0$	
151	AABOUD	16AE	ATLS	$H_2^0 \to W^+ W^-$, $Z Z$	
152	AABOUD	16H	ATLS	$H_2^0 \to \gamma\gamma$	
153	AABOUD	16I	ATLS	$H_2^0 \to H H$	
154	AAD	16AX	ATLS	$H \to Z Z$	
155	AAD	16C	ATLS	$H \to W^+ W^-$	
156	AAD	16L	ATLS	$H \to A^0 A^0$	
157	AAD	16L	ATLS	$H_2^0 \to A^0 A^0$	OCCUR=2
158	AALTONEN	16C	CDF	$H_1^0 H^\pm \to H_1^0 H_1^0 W^*$, $H_1^0 \to \gamma\gamma$	
159	KHACHATRY...	16BG	CMS	$H_2^0 \to H H$	
160	KHACHATRY...	16BQ	CMS	$p p$, 8 TeV, $H_2^0 \to H H$	
161	KHACHATRY...	16F	CMS	$H \to H_1 H_1$	

		[162] KHACHATRY...	16M	CMS	$H_2^0 \to \gamma\gamma$	
		[163] KHACHATRY...	16P	CMS	$H_2^0 \to HH$	
		[164] KHACHATRY...	16P	CMS	$A^0 \to ZH$	OCCUR=2
		[165] AAD	15BK	ATLS	$H_2^0 \to HH$	
		[166] AAD	15BZ	ATLS	$H \to A^0 A^0$	
		[167] AAD	15BZ	ATLS	$H_2^0 \to A^0 A^0$	OCCUR=2
		[168] AAD	15CE	ATLS	$H_2^0 \to HH$	
		[169] AAD	15H	ATLS	$H_2^0 \to HH$	
		[170] AAD	15S	ATLS	$A^0 \to ZH$	
		[171] KHACHATRY...	15AW	CMS	$H_2^0 \to W^+ W^-$, ZZ	
		[172] KHACHATRY...	15BB	CMS	$H \to \gamma\gamma$	
		[173] KHACHATRY...	15N	CMS	$A^0 \to ZH$	OCCUR=2
		[174] KHACHATRY...	15O	CMS	$A^0 \to ZH$	
		[175] KHACHATRY...	15R	CMS	$H_2^0 \to HH$	
		[176] AAD	14AP	ATLS	$H \to \gamma\gamma$	
		[177] AAD	14M	ATLS	$H_2^0 \to H^\pm W^\mp \to HW^\pm W^\mp$, $H \to b\overline{b}$	
		[178] CHATRCHYAN	14G	CMS	$H \to WW^{(*)}$	
		[179] KHACHATRY...	14P	CMS	$H \to \gamma\gamma$	
		[180] AALTONEN	13P	CDF	$H'^0 \to H^\pm W^\mp \to HW^+ W^-$	
		[181] CHATRCHYAN	13BJ	CMS	$H \to A^0 A^0$	
		[182] AALTONEN	11P	CDF	$t \to bH^+$, $H^+ \to W^+ A^0$	
		[183] ABBIENDI	10	OPAL	$H \to \widetilde{\chi}_1^0 \widetilde{\chi}_2^0$	OCCUR=2
		[184] SCHAEL	10	ALEP	$H \to A^0 A^0$	
		[185] ABAZOV	09V	D0	$H \to A^0 A^0$	
none 3–63	95	[186] ABBIENDI	05A	OPAL	A^0, Type II model	OCCUR=2
>104	95	[187] ABBIENDI	04K	OPAL	$H \to$ 2 jets	
		[188] ABDALLAH	04	DLPH	HVV couplings	
>110.3	95	[189] ACHARD	04B	L3	$H \to$ 2 jets	
		[190] ACHARD	04F	L3	Anomalous coupling	
		[191] ABBIENDI	03F	OPAL	$e^+ e^- \to HZ$, $H \to$ any	
		[192] ABBIENDI	03G	OPAL	$H_1^0 \to A^0 A^0$	
>105.4	95	[193,194] HEISTER	02L	ALEP	$H_1^0 \to \gamma\gamma$	
>109.1	95	[195] HEISTER	02M	ALEP	$H \to$ 2 jets or $\tau^+ \tau^-$	
none 12–56	95	[196] ABBIENDI	01E	OPAL	A^0, Type-II model	OCCUR=2
		[197] ACCIARRI	00R	L3	$e^+ e^- \to H\gamma$ and/or $H \to \gamma\gamma$	
		[198] ACCIARRI	00R	L3	$e^+ e^- \to e^+ e^- H$	OCCUR=2
		[199] GONZALEZ...	98B	RVUE	Anomalous coupling	
		[200] KRAWCZYK	97	RVUE	$(g-2)_\mu$	
		[201] ALEXANDER	96H	OPAL	$Z \to H\gamma$	OCCUR=2

[1] AAD 25AL search for production of H_2^0/A^0 in association with a $t\overline{t}$ pair, decaying to $t\overline{t}$, resulting in final states with one lepton or two opposite-sign leptons, using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 8 for limits on cross section times branching ratios for $m_{H_2^0}$ and/or m_{A^0} = 0.4–1.0 TeV. Combined limits with AAD 23BG are shown in Fig. 10. NODE=S055H2O;LINKAGE=UF

[2] AAD 25AN search for production of A^0 in association with a $t\overline{t}$ pair, in the decay $A^0 \to b\overline{b}$ using 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 9 for limits on cross section times branching ratio for m_{A^0} = 12–100 GeV. If the top Yukawa coupling is as strong as the one of the Standard Model Higgs and B($A^0 \to b\overline{b}$) = 1, the whole mass range is excluded at 95%CL. NODE=S055H2O;LINKAGE=BG

[3] AAD 25AU search for the decay $H \to A^0 A^0 \to \tau^+ \tau^- \tau^+ \tau^-$, each tau pair decaying to hadrons + muon final states, in 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 4 for limits on the product of production cross section (normalized to the SM) and branching ratios in the range m_{A^0} = 4–15 GeV, and Fig. 5 for the interpretation in terms of a model with two Higgs doublets plus a singlet. NODE=S055H2O;LINKAGE=FG

[4] AAD 25AW search for the decay $H \to A^0 A^0 \to b\overline{b}b\overline{b}$ in associated ZH production using 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 14 for limits on the product of production cross section (normalized to the SM) and branching ratios in the range m_{A^0} = 12–60 GeV. NODE=S055H2O;LINKAGE=HG

[5] AAD 25AW search for the decay $H \to A_1^0 A_2^0 \to b\overline{b}b\overline{b}$ and $H \to A_1^0 A_2^0 \to A_1^0 A_1^0 A_1^0 \to b\overline{b}b\overline{b}b\overline{b}$ in associated ZH production using 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 15 for limits on the product of production cross section (normalized to the SM) and branching ratios for several combinations of $m_{A_1^0}$ and $m_{A_2^0}$. NODE=S055H2O;LINKAGE=IG

[6] AAD 25AY search for $H \to H_1^0 H_1^0$ with hadronically decaying H_1^0 having a long lifetime resulting in displaced vertex, using 140 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. The case the parent particle has a different mass $H_{2/3}^0 \to H_1^0 H_1^0$) are also examined. See their Figs. 12 and 13 for limits with decay length in the range 0.01–1000 m. NODE=S055H2O;LINKAGE=JG

[7] AAD 25F search for $H_{1/2}^0 \to Z' Z'$ with $Z' \to \ell^+ \ell^-$ using 139 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 5 for limits on production cross section times branching ratios for $m_{H_1^0}$ = 40–115 GeV, $m_{H_2^0}$ = 130–800 GeV, and $m_{Z'}$ = 15–300 GeV. NODE=S055H2O;LINKAGE=XF

[8] AAD 25J search for production of H_3^0 decaying to $H_2^0 H$, $H_2^0 \to HH$ in the $b\overline{b}b\overline{b}b\overline{b}$ final state, using 126 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Figs. 7 and 8 for limits on production cross section times branching ratios in the ranges $m_{H_3^0}$ = 325–1500 GeV and $m_{H_2^0}$ = 250–1000 GeV. NODE=S055H2O;LINKAGE=VF

[9] AAD 25O search for $H_1^0 \to \gamma\gamma$ in 140 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Figs. 6(b), 8(b) and 9(b) for limits on cross section times branching ratio for $m_{H_1^0}$ = 66–110 GeV. Fig. 9(b) assumes Standard Model Higgs-like properties. NODE=S055H2O;LINKAGE=AG

[10] AAD 25X search for the decay chain $H \to A^0 A^0 \to \gamma\gamma\tau^+\tau^-$ in 140 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 5(b) for limits on the product of branching ratios for m_{A^0} = 10–60 GeV, assuming SM-like production. NODE=S055H2O;LINKAGE=CG

[11] ADAN 25 searches for $H \to A^0 A^0 \to \mu^+ \mu^- c\overline{c}$ using publicly available CMS data of 16.4 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See his Fig. 7 for limits on the product of production cross section (normalized to the SM) and branching ratios in the range m_{A^0} = 4–11 GeV, and Fig. 8 for the interpretation in terms of a model with two Higgs doublets plus a singlet. NODE=S055H2O;LINKAGE=NG

[12] CHEKHOVSKY 25C search for $H_2^0/A^0 \to b\overline{b}$ by b-associated prodution using 36.7–126.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Figs. 11–14 for limits on cross section times branching ratio for $m_{H_2^0}$, m_{A^0} = 0.125–1.8 TeV. NODE=S055H2O;LINKAGE=ZF

[13] CHEKHOVSKY 25D search for invisibly decaying $H_1^0/H_2^0/A^0$ produced in association with t or $t\overline{t}$, using 138 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 5 for limits on cross section times branching ratio for masses between 50 and 500 GeV. NODE=S055H2O;LINKAGE=EG

[14] CHEKHOVSKY 25I search for production of an A^0 in gluon-gluon fusion and in association with a $b\overline{b}$, decaying to ZH in the final states $\ell^+\ell^-\tau^+\tau^-$, assuming B($H \to \tau^+\tau^-$) of the SM, using 138 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 4 for limits on cross section times branching ratio for m_{A^0} = 0.225–1.0 TeV for the two production mechanisms, and Figs. 5, 6 for constraints on the combination of the two production mechanisms. NODE=S055H2O;LINKAGE=LG

[15] CHEKHOVSKY 25J search for $A_2^0 \to HA_1^0$, A_1^0 escaping detection, using 101 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. In the framework of two Higgs doublet plus a singlet model, limits on signal strengths are given in their Figs. 3 and 4 with varying model parameters. NODE=S055H2O;LINKAGE=KG

[16] CORTINA-GIL 25B search for the decay $K^+ \to \pi^+ H_1^0$, with H_1^0 escaping detection or decaying to $\mu^+\mu^-$. See their Figs. 2, 3, and 6 for limits on the product of branching ratios for $m_{H_1^0}$ = 0–0.33 GeV, and Fig. 9 for limits on the mixing with the Standard Model Higgs boson. NODE=S055H2O;LINKAGE=GG

[17] HAYRAPETYAN 25A search for the decay $H_1^0 \to \gamma\gamma$ in 132 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 5 for limits on cross section times branching ratio for $m_{H_1^0}$ = 70–110 GeV. NODE=S055H2O;LINKAGE=GF

[18] HAYRAPETYAN 25AP search for $H_3^0 \to HH_{1/2}^0$ with decays $H \to b\overline{b}$ and $H_{1/2}^0 \to \gamma\gamma$ using 132 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Figs. 5 and 6 for limits on cross section times branching ratio for $m_{H_3^0}$ = 0.24–1.0 TeV and $m_{H_{1/2}^0}$ = 0.07–0.8 TeV. NODE=S055H2O;LINKAGE=MG

[19] HAYRAPETYAN 25C search for production of H_3^0 in the decay chain $H_3^0 \to H_1^0 H_1^0$, $H_1^0 \to \gamma\gamma$ using 138 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 3 for limits on cross section times branching ratio for $m_{H_3^0}$ = 0.3–3 TeV, $m_{H_1^0}/m_{H_3^0}$ = 0.005–0.025. NODE=S055H2O;LINKAGE=YF

[20] HAYRAPETYAN 25I search for $A^0 \to ZH_2^0$ with $H_2^0 \to t\overline{t}$ using 138 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 5 for limits on production cross section times branching ratios for m_{A^0} = 0.45–2.1 TeV and $m_{H_2^0}$ = 0.35–2.0 TeV. NODE=S055H2O;LINKAGE=WF

[21] HAYRAPETYAN 25P search for A^0 decaying to invisible final states, produced in association with a $b\overline{b}$ pair, using 138 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 7 for limits on cross section times branching ratio for m_{A^0} = 50–500 GeV and Fig. 8 for excluded parameter space, both in the two-Higgs-doublet plus singlet pseudoscalar model. NODE=S055H2O;LINKAGE=DG

22 AAD 24A search for the decay $H^0_2 \rightarrow Z\gamma$ with Z decaying to e^+e^- or $\mu^+\mu^-$ using 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 4 for limits on production cross section times branching ratios for $m_{H^0_2}$ = 0.22–3.4 TeV. NODE=S055H2O;LINKAGE=QE

23 AAD 24AP search for production of a heavy H^0_2 or A^0 decaying to $t\overline{t}$ in 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 15 and 16 for limits on the Yukawa coupling for m_{A^0}, $m_{H^0_2}$ = 0.4–1.4 TeV for different assumptions on width over mass. NODE=S055H2O;LINKAGE=FF

24 AAD 24BQ search for the decay chain $H \rightarrow A^0 A^0 \rightarrow b\overline{b}\tau^+\tau^-$, produced by gluon fusion, vector boson fusion, or in association with a weak vector boson, in 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 10 for limits on the product of branching ratios in the range m_{A^0} = 12–60 GeV. NODE=S055H2O;LINKAGE=HF

25 AAD 24BV search for H^0_2 produced by vector-boson fusion, decaying to $HH \rightarrow b\overline{b}b\overline{b}$, using 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 8 for limits on the product of production cross section times branching ratios for $m_{H^0_2}$ = 1–5 TeV. NODE=S055H2O;LINKAGE=TF

26 AAD 24BW search for production of H^0_3 decaying to $H^0_2 H$, $H^0_2 \rightarrow W^+W^-$ or ZZ, and $H \rightarrow \gamma\gamma$ using 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 6–8 for limits on production cross section times branching ratios in the ranges $m_{H^0_3}$ = 0.3–1.0 TeV and $m_{H^0_2}$ = 0.17–0.5 TeV. NODE=S055H2O;LINKAGE=KF

27 AAD 24BX search for production of H^0_4 decaying to $H^0_2 H^0_3$, $H^0_2 \rightarrow$ invisible, and $H^0_3 \rightarrow ZZ \rightarrow 4\ell$, using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 8 (a), (b) for limits on production cross section times branching ratios in the ranges $m_{H^0_4}$ = 0.39–1.3 TeV, $m_{H^0_3}$ = 0.22–1.0 TeV, and $m_{H^0_2}$ = 160 GeV. NODE=S055H2O;LINKAGE=LF

28 AAD 24BX search for production of A^0 decaying to $H^0_2 Z$, $H^0_2 \rightarrow ZZ$, resulting in 4ℓ final states, using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 8 (c), (d) for limits on production cross section times branching ratios in the ranges m_{A^0} = 0.32–1.3 TeV and $m_{H^0_2}$ = 0.22–1.0 TeV. NODE=S055H2O;LINKAGE=MF

29 AAD 24CA search for production of H^0_3 decaying to $H^0_{1,2} H$, $H^0_{1,2} \rightarrow b\overline{b}$, and $H \rightarrow \gamma\gamma$ using 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 4 for limits on production cross section times branching ratios in the ranges $m_{H^0_3}$ = 0.17–1.0 TeV and $m_{H^0_{1,2}}$ = 0.015–0.5 TeV. NODE=S055H2O;LINKAGE=NF

30 AAD 24CD search for production of H^0_2 decaying to ZA, $A \rightarrow$ invisible, using 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 8–12 for excluded parameter regions in two-Higgs-doublet plus singlet pseudoscalar model. NODE=S055H2O;LINKAGE=OF

31 AAD 24CF search for gluon-fusion production of A^0 decaying to $\tau^+\tau^-$ in 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 7 for limits on cross section times branching ratio in the range m_{A^0} = 20–90 GeV, and Fig. 8 for A^0 coupling with the top quark. NODE=S055H2O;LINKAGE=JF

32 AAD 24CI search for production of H^0_2, A^0 decaying to invisible final states, in various channels including $t\overline{t}$ + missing E_T and $t\overline{t}t\overline{t}$, using up to 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 3 for cross section limits in a simplified model with fixed Dark Matter mass and couplings to quarks and Dark Matter. NODE=S055H2O;LINKAGE=QF

33 AAD 24CK combines published ATLAS data up to 139 fb^{-1} to constrain two-Higgs-doublet plus singlet pseudoscalar model with A^0_1 decaying to invisibly into Dirac Dark Matter final states. See their Figs. 4–9 for excluded parameter regions. NODE=S055H2O;LINKAGE=RF

34 AAD 24H combine searches for a scalar resonance decaying to HH using up to 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV from AAD 22F, AAD 23Z, and AAD 22Y. See their Fig. 1 for limits on cross section times branching ratio for $m_{H^0_2}$ = 0.251–5.0 TeV. NODE=S055H2O;LINKAGE=YE

35 AAD 24K search for the decay $H \rightarrow ZA^0$ with $A^0 \rightarrow \gamma\gamma$ and $Z \rightarrow \ell^+\ell^-$ in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. Merged $\gamma\gamma$ events as well as resolved ones are looked for. See their Fig. 3 for limits on the product of the branching ratios for m_{A^0} = 0.1–33 GeV. NODE=S055H2O;LINKAGE=AF

36 ADACHI 24F search for H^0_1, which couples preferentially to muon pairs, in the process $e^+e^- \rightarrow \mu^+\mu^- H^0_1 \rightarrow \mu^+\mu^-\mu^+\mu^-$ using 178 fb^{-1} of e^+e^- collisions at E_{cm} = 10.58 GeV. See their Fig. 13 (lower) for limits on cross section times branching ratio for $m_{H^0_1}$ = 0.212–9.0 GeV. Limits on the model parameter are given in Fig. 14 (lower). NODE=S055H2O;LINKAGE=CF

37 HAYRAPETYAN 24AA search for the decay chain $H \rightarrow A^0 A^0 \rightarrow b\overline{b}b\overline{b}$, produced in association with $W^\pm$ or Z, in 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 3 for limits on the product of branching ratios in the range m_{A^0} = 15–60 GeV. NODE=S055H2O;LINKAGE=WE

38 HAYRAPETYAN 24AE search for $H^0_2 \rightarrow HH$ in the final state $b\overline{b}W^+W^-$ using 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 19 (upper) for limit on the product of production cross section times branching ratios for $m_{H^0_2}$ = 0.25–0.9 TeV. NODE=S055H2O;LINKAGE=VE

[39] HAYRAPETYAN 24AF search for $H \rightarrow A^0 A^0$ in the final state $b\overline{b}\mu^+\mu^-$ and $b\overline{b}\tau^+\tau^-$ in 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 10, 11, and 12 for limits on the product of branching ratios in the range m_{A^0} = 12–60 GeV. Interpretation of the limits in terms of two Higgs doublet plus singlet models is given in their Figs. 13 and 14. NODE=S055H2O;LINKAGE=BF

[40] HAYRAPETYAN 24AI search for $H \rightarrow H^0_1 H^0_1$, with long-lived H^0_1 decaying in the muon detectors to $\gamma\gamma$, e^+e^-, $\pi^0\pi^0$, $\pi^+\pi^-$, K^+K^-, K^0K^0, $d\overline{d}$, $\tau^+\tau^-$, or $b\overline{b}$, using 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 13–17 for limits on B($H \rightarrow H^0_1 H^0_1$) in the mass range between 0.4 and 55 GeV for each of the decay modes. NODE=S055H2O;LINKAGE=EF

[41] HAYRAPETYAN 24AJ search for production of a scalar resonance decaying to $\gamma\gamma$ in 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 3 (right) for limits on production cross section times branching ratio for $m_{H^0_2}$ = 0.6–5.0 TeV, and Fig. 4 (lower) for their dependence on the width. NODE=S055H2O;LINKAGE=XE

[42] HAYRAPETYAN 24AZ search for pair production of A^0 decaying to $\mu^+\mu^-$ using 101–137 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 5 for limits on cross section times branching ratio for m_{A^0} = 0.21–60 GeV. NODE=S055H2O;LINKAGE=IF

[43] HAYRAPETYAN 24AZ search for H or $H^0_{1,2}$ decaying to $A^0 A^0 \rightarrow \mu^+\mu^-\mu^+\mu^-$ using 101–137 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 8 for limits on cross section times branching ratio for m_{A^0} = 0.5–2.7 GeV and several choices of $m_{H^0_{1,2}}$ in a NMSSM scenario. NODE=S055H2O;LINKAGE=SF

[44] HAYRAPETYAN 24I search for the decay $H \rightarrow Z A^0$ with $A^0 \rightarrow \gamma\gamma$ and $Z \rightarrow \ell^+\ell^-$ in 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 7 for limits on the product of cross section times the branching ratios for m_{A^0} = 1–30 GeV. NODE=S055H2O;LINKAGE=ZE

[45] TUMASYAN 24A search for production of $H^0_{1,2}$ in association with W, Z, or $t\overline{t}$, decaying to e^+e^-, $\mu^+\mu^-$, or $\tau^+\tau^-$, using 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 13 for limits on cross section times branching ratio for $m_{H^0_{1,2}}$ = 15–350 GeV. See also Figs. 16 and 17 for limits on the mixing with the Standard Model Higgs boson. NODE=S055H2O;LINKAGE=DF

[46] TUMASYAN 24B search for $H^0_2 \rightarrow HH$ in the final state $\gamma\gamma b\overline{b}$ using 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 6 (upper) for limit on the product of production cross section times branching ratios for $m_{H^0_2}$ = 0.26–1.0 TeV. NODE=S055H2O;LINKAGE=TE

[47] TUMASYAN 24B search for production of H^0_3 decaying to $H^0_{1,2} H \rightarrow b\overline{b}\gamma\gamma$ using 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 7 for limits on production cross section times branching ratios for $m_{H^0_3}$ = 0.3–1.0 TeV and $m_{H^0_{1,2}}$ = 0.09–0.8 TeV. NODE=S055H2O;LINKAGE=UE

[48] AAD 23AD search for associated production of $W/Z H^0_2$ with the decay chain $H^0_2 \rightarrow HH \rightarrow b\overline{b}b\overline{b}$ using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 9 for limits on cross section times branching ratios for $m_{H^0_2}$ = 260–1000 GeV. NODE=S055H2O;LINKAGE=BE

[49] AAD 23AD search for gluon fusion production of A^0 with the decay chain $A^0 \rightarrow Z H^0_2$, $H^0_2 \rightarrow HH \rightarrow b\overline{b}b\overline{b}$ using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 10 for limits on cross section times branching ratios for m_{A^0} = 350–800 GeV and $m_{H^0_2}$ = 260–400 GeV. NODE=S055H2O;LINKAGE=CE

[50] AAD 23AJ search for production of $H^\pm$ in association with a top quark, followed by $H^\pm \rightarrow W^\pm A^0$, $A^0 \rightarrow$ invisible, using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 10 for excluded parameter regions of 2HDM + CP-odd singlet model. NODE=S055H2O;LINKAGE=GE

[51] AAD 23BD search for a top quark decaying to $q H^0_{1,2}$ ($q = u$, c), $H^0_{1,2} \rightarrow b\overline{b}$, using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 9 for limits on production cross section times branching ratios for $m_{H^0_{1,2}}$ = 20–160 GeV. NODE=S055H2O;LINKAGE=YD

[52] AAD 23BE search for associated production of $H^0_2 W$ and decay $H^0_2 \rightarrow W^+W^-$ assuming the presence of higher dimensional $H^0_2 W^+W^-$ interactions, using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 6 for excluded parameter region of higher dimensional operators, and Fig. 7 for limits on cross section times branching ratio for $m_{H^0_2}$ = 0.3–1.5 TeV. NODE=S055H2O;LINKAGE=FE

[53] AAD 23BG search for production of H^0_2/A^0 in association with a $t\overline{t}$ pair, decaying to $t\overline{t}$, resulting in final states with two same-sign leptons or three or more leptons, using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 7 (corrected version in the erratum) for limits on cross section times branching ratios for $m_{H^0_2}$ and/or m_{A^0} = 0.4–1.0 TeV. NODE=S055H2O;LINKAGE=EE

[54] AAD 23BW search for A^0 production in association with a $t\overline{t}$ pair, decaying to $\mu^+\mu^-$, using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 5(a) for limits on production cross section times branching ratio for m_{A^0} = 15–72 GeV. NODE=S055H2O;LINKAGE=RE

[55] AAD 23BX search for production of $H \rightarrow \tau^+\tau^-$ with missing transverse momentum using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 8 for interpretation of the data in terms of 2HDM + a model. NODE=S055H2O;LINKAGE=LE

[56] AAD 23CA search for production of H^0_3 decaying to $H^0_2 H$, $H^0_2 \rightarrow W^+ W^-$ or ZZ, and $H \rightarrow \tau^+\tau^-$ using 140 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 4, 5 for limits on production cross section times branching ratios in the ranges $m_{H^0_3}$ = 0.5–1.5 TeV and $m_{H^0_2}$ = 0.2–0.5 TeV. NODE=S055H2O;LINKAGE=KE

[57] AAD 23CR search for H^0_2 having flavor-violating couplings to tc or tu, produced in association with top quark(s), using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 14 for limits on production cross section times branching ratios for $m_{H^0_2}$ = 0.2–1.5 TeV with various assumptions on the flavor-changing couplings. NODE=S055H2O;LINKAGE=OE

[58] AAD 23O search for production of an A^0 in gluon-gluon fusion and in association with a $b\overline{b}$, decaying to ZH in the final states $\nu\overline{\nu}b\overline{b}$ and $\ell^+\ell^- b\overline{b}$ using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 9 for limits on cross section times branching ratio for m_{A^0} = 0.22–2.0 TeV, and Fig. 11 for limits with both production components. NODE=S055H2O;LINKAGE=XD

[59] AAD 23R search for the decay $A^0 \rightarrow \gamma\gamma$ in 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 7 for limits on cross section times branching ratio for m_{A^0} = 10–70 GeV. NODE=S055H2O;LINKAGE=RD

[60] AAD 23U search for the decay $H^0_2 \rightarrow Z\gamma$ with Z decaying hadronically in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 8(a) for limits on production cross section times branching ratios for $m_{H^0_2}$ = 1.0–6.8 TeV. NODE=S055H2O;LINKAGE=TD

[61] AAD 23Z search for the decay chain $H^0_2 \rightarrow HH \rightarrow b\overline{b}\tau^+\tau^-$ using 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 10 for limits on the product of production cross section times branching ratios for $m_{H^0_2}$ = 0.251–1.6 TeV. NODE=S055H2O;LINKAGE=WD

[62] HAYRAPETYAN 23C search for $H^0_{1,2} \rightarrow e\mu$ using 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 7 for limits on production cross section times branching ratio for $m_{H^0_{1,2}}$ = 110–160 GeV. NODE=S055H2O;LINKAGE=SE

[63] HAYRAPETYAN 23G search for dimuon resonance in the mass range 1.1–2.6 or 4.2–7.9 GeV in 96.6 fb^{-1} of pp collisions at E_{cm} = 13 TeV, in inclusive and high p_T selections. See their Fig. 5 for cross section times branching ratio limits and Fig. 7 for mixing angle limits in two Higgs doublet plus singlet model (at 90% CL). NODE=S055H2O;LINKAGE=JE

[64] TUMASYAN 23 search for production of H^0_3 decaying to $H^0_{1,2} H \rightarrow b\overline{b}b\overline{b}$ using 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 4 for limits on production cross section times branching ratios for $m_{H^0_3}$ = 0.9–4.0 TeV and $m_{H^0_{1,2}}$ = 60–600 GeV, and their interpretation in the NMSSM and the Two Real Singlet Model (TRSM). NODE=S055H2O;LINKAGE=DE

[65] TUMASYAN 23M search for the decay chain $H \rightarrow A^0 A^0 \rightarrow \gamma\gamma\gamma\gamma$ in 132 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 6 for limits on cross section times branching ratio in the range m_{A^0} = 15–62 GeV. NODE=S055H2O;LINKAGE=SD

[66] TUMASYAN 23O search for $H^0_2 \rightarrow HH$, each H decaying to either WW^* or $\tau^+\tau^-$ using 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 14 (upper) for limit on the product of production cross section times branching ratios for $m_{H^0_2}$ = 0.25–1.0 TeV. NODE=S055H2O;LINKAGE=UD

[67] TUMASYAN 23S search for gluon fusion and b-associated production of $H^0_{1,2}$ decaying to $\tau^+\tau^-$ using 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 10 for limits on production cross section times branching ratios for $m_{H^0_{1,2}}$ = 0.06–3.5 TeV. NODE=S055H2O;LINKAGE=ZD

[68] AAD 22A search for the decay chain $H \rightarrow A^0 A^0 \rightarrow \mu^+\mu^- b\overline{b}$ in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 9 for limits on the overall branching fraction in the range m_{A^0} = 16–62 GeV. See also Fig. 11 for limits without assuming A^0 is pseudoscalar. NODE=S055H2O;LINKAGE=CD

[69] AAD 22D search for ZA^0 associate production with $Z \rightarrow \ell^+\ell^-$, A^0 decaying invisibly, in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 5 for excluded regions in the mass parameter space of two Higgs doublet plus singlet (2HDM+A^0) model with a certain choice of the model parameters. NODE=S055H2O;LINKAGE=JD

[70] AAD 22F search for gluon fusion production of H^0_2 decaying to $HH \rightarrow b\overline{b}b\overline{b}$ using 126–139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. B($H \rightarrow b\overline{b}$) = 0.582 is assumed. See their Fig. 14 for limit on the product of production cross section times branching ratios for $m_{H^0_2}$ = 0.251–5.0 TeV. NODE=S055H2O;LINKAGE=ID

[71] AAD 22I search for ZH associate production with the decay chain $H \rightarrow \widetilde{\chi}^0_2\widetilde{\chi}^0_1$, $\widetilde{\chi}^0_2 \rightarrow A^0\widetilde{\chi}^0_1$, $A^0 \rightarrow b\overline{b}$, and $Z \rightarrow \ell^+\ell^-$, in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 3 and 4 for limits on the product of cross section times the branching ratios for m_{A^0} = 20–65 GeV with various choices of NMSSM model parameters. NODE=S055H2O;LINKAGE=KD

[72] AAD 22J search for the decay $H \rightarrow ZA^0$ with $A^0 \rightarrow \mu^+\mu^-$ and $Z \rightarrow e^+e^-$, $\mu^+\mu^-$ in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV assuming SM gluon-gluon fusion production of the H. See their Fig. 17(b) for limits on the product of cross section times the branching ratios for m_{A^0} = 15–30 GeV. NODE=S055H2O;LINKAGE=LD

[73] AAD 22J search for the decay $H \to A^0 A^0$ with $A^0 \to \mu^+ \mu^-$ in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV assuming SM gluon-gluon fusion production of the H in the range of m_{A^0} = 1–60 GeV . See their Fig. 14(b) for limits on the product of cross section times the branching ratios for m_{A^0} = 1.5–60 GeV (excluding ψ and Υ regions). The limit also applies to the decay $H \to H^0_1 H^0_1$. NODE=S055H2O;LINKAGE=MD

[74] AAD 22P search for invisibly decaying H^0_1, H^0_2 produced by vector boson fusion in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. Limit on the product of cross section times branching ratio in the range 0.1–1 pb (95% CL) is given for the mass range 0.05–2 TeV. See their Fig. 14. NODE=S055H2O;LINKAGE=ND

[75] AAD 22Y search for gluon fusion production of H^0_2 decaying to $HH \to b\overline{b}\gamma\gamma$ in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 15 for limit on the product of production cross section times branching ratios to HH for $m_{H^0_2}$ = 0.251–1.0 TeV. NODE=S055H2O;LINKAGE=PD

[76] ABRATENKO 22A search for a singlet scalar boson H^0_1 having a small mixing with the SM Higgs boson in the decay chain $K^+ \to H^0_1 \pi^+$, $H^0_1 \to \mu^+ \mu^-$ from data corresponding to 7.01×10^{20} protons on NuMI target. See their Fig. 13 (right) and Table V for limits on the SM Higgs component of H^0_1 for $m_{H^0_1}$ = 212–279 MeV. NODE=S055H2O;LINKAGE=QD

[77] TUMASYAN 22AK search for gluon-fusion production of H^0_3 decaying to $H^0_1 H^0_1 \to b\overline{b}b\overline{b}$ in 138 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 5 for limits on cross section times branching ratio for $m_{H^0_3}$ = 1–3 TeV, $m_{H^0_1}$ = 25–100 GeV. NODE=S055H2O;LINKAGE=OD

[78] TUMASYAN 22D search for production of an H^0_2 (denoted radion in the paper) in gluon fusion and vector boson fusion, decaying to $W^+ W^-$ in the final states $\ell\nu$ + hadrons, using 137 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 7 for limits on cross section times branching ratio for $m_{H^0_2}$ = 1.0–4.5 TeV. NODE=S055H2O;LINKAGE=HE

[79] AAD 21AF search for production of a heavy H^0_2 state decaying to ZZ in the final states $\ell^+ \ell^- \ell'^+ \ell'^-$ and $\ell^+ \ell^- \nu\overline{\nu}$ in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 4 for upper limits on cross section times branching ratio for $m_{H^0_2}$ = 0.2–2.0 TeV assuming ggF or VBF with narrow width approximation, and Fig. 5 for upper limits on cross section times branching ratio for $m_{H^0_2}$ = 0.4–2.0 TeV assuming ggF, and with several assumptions on its width. NODE=S055H2O;LINKAGE=XC

[80] AAD 21AI search for production of an A^0 in gluon-gluon fusion and in association with a $b\overline{b}$, decaying to $ZH^0_2 \to \ell^+ \ell^- b\overline{b}$ or $\ell^+ \ell^- W^+ W^-$ in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 9 and 13 for cross section limits for m_{A^0} = 230–800 GeV and $m_{H^0_2}$ = 130–700 GeV. NODE=S055H2O;LINKAGE=YC

[81] AAD 21AY search for production of a scalar resonance decaying to $\gamma\gamma$ in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 5(a) for limits on fiducial cross section times branching ratio for $m_{H^0_2}$ = 0.16–3 TeV with narrow width approximation, and Table 2 with several assumptions on the width. NODE=S055H2O;LINKAGE=ZC

[82] AAD 21AZ search for production of A^0_2 decaying to HA^0_1 followed by $H \to \gamma\gamma$, $A^0_1 \to$ invisible in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 10–12 for limits in terms of two-Higgs-doublet model plus singlet pseudoscalar and a fermionic Dark Matter particle. NODE=S055H2O;LINKAGE=FD

[83] AAD 21BB search for production of A^0_2 by gluon fusion or associated $A^0_2 b\overline{b}$ production, decaying to HA^0_1 followed by $H \to b\overline{b}$, $A^0_1 \to$ invisible in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 8 for limits in terms of two-Higgs-doublet plus singlet pseudoscalar model. NODE=S055H2O;LINKAGE=GD

[84] AAD 21BE search for production of A^0_1 associated with a single top quark and either a light quark or a W boson, decaying to invisible final states, in 139 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 13–15 for limits in terms of two-Higgs-doublet model plus singlet pseudoscalar, which is assumed to decay to a pair of Dark Matter particles. NODE=S055H2O;LINKAGE=HD

[85] ABRATENKO 21 search for a singlet scalar boson H^0_1 having a small mixing with the SM Higgs boson in the decay chain $K^+ \to H^0_1 \pi^+$, $H^0_1 \to e^+ e^-$ from data corresponding to 1.93×10^{20} protons on NuMI target. See their Fig. 2 for limits on the SM Higgs component of H^0_1 for $m_{H^0_1}$ = 3–210 MeV. NODE=S055H2O;LINKAGE=DD

[86] SIRUNYAN 21A search for $H^0_2 \to ZA^0$ with $Z \to \ell^+ \ell^-$, A^0 decaying invisibly, in 137 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 8 for excluded regions in the mass parameter space of two Higgs doublet plus singlet model with a certain choice of the model parameters. NODE=S055H2O;LINKAGE=VC

[87] TUMASYAN 21F search for gluon fusion production of H^0_3 decaying to $HH^0_{1,2} \to \tau^+ \tau^- b\overline{b}$ in 137 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 5 and 6 for limits on cross section times branching ratios for $m_{H^0_{1,2}}$ = 0.06–2.8 TeV and $m_{H^0_3}$ = 0.24–3.0 TeV. NODE=S055H2O;LINKAGE=ED

[88] AAD 20AA search for $H_2^0/A^0 \rightarrow \tau^+\tau^-$ produced by gluon fusion or b-associated production using 139 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 2(a), 2(b) for limits on the product of cross section and branching ratio for $m_{H_2^0}$, m_{A^0} = 0.2–2.5 TeV. NODE=S055H2O;LINKAGE=LC

[89] AAD 20AI search for ZH production followed by the decay $H \rightarrow A^0A^0 \rightarrow b\overline{b}b\overline{b}$ in 36 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. The search looks for collimated $A^0 \rightarrow b\overline{b}$ decays and is complementary to AABOUD 18BX. See their Fig. 10 for limits on the product of production cross section and branching ratios in the range m_{A^0} = 15–30 GeV. NODE=S055H2O;LINKAGE=TC

[90] AAD 20AO search for gluon fusion production of H_2^0 decaying to $HH \rightarrow \tau^+\tau^- b\overline{b}$ (with hadronically decaying $\tau^+\tau^-$) using 139 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. Limit on the product of production cross section times branching ratios in the range 28–817 fb (95% CL) is given for m_{A^0} = 1.0–3.0 TeV, see their Fig. 13. NODE=S055H2O;LINKAGE=UC

[91] AAD 20C combine searches for a scalar resonance decaying to HH in 36.1 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV from AABOUD 19A, AABOUD 19O, AABOUD 18CQ, AABOUD 19T, AABOUD 18CW, and AABOUD 18BU. See their Fig. 5(a) for limits on cross section times branching ratio for $m_{H_2^0}$ = 0.26–3 TeV. NODE=S055H2O;LINKAGE=WB

[92] AAD 20L search for b-associated production of H_2^0 decaying to $b\overline{b}$ in 27.8 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 8 for limits on the product of cross section and branching ratio for $m_{H_2^0}$ = 0.45–1.4 TeV. NODE=S055H2O;LINKAGE=RC

[93] AAD 20X search for vector-boson-fusion production of H_2^0 decaying to HH using 126 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 5 for limits on the product of cross section and branching ratio for the assumptions of a narrow- and broad-width resonance. NODE=S055H2O;LINKAGE=QC

[94] AAIJ 20AL search for dimuon resonance in the mass range 0.2–60 GeV in 5.1 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV, in inclusive and b quark associated production. Displaced decays are searched for for masses below 3 GeV. See their Figs. 7–9 for cross section limits and Fig. 10 for limits for mixing angle in two Higgs doublet plus singlet model (at 90% CL). NODE=S055H2O;LINKAGE=WC

[95] SIRUNYAN 20 search for the decay $H \rightarrow A^0A^0 \rightarrow \tau^+\tau^-\tau^+\tau^-$ or $\tau^+\tau^-\mu^+\mu^-$ in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 10 for limits on the product of production cross section (normalized to the SM) and branching ratios in the range m_{A^0} = 4–15 GeV. NODE=S055H2O;LINKAGE=GC

[96] SIRUNYAN 20AA search for $H_2^0 \rightarrow ZA^0$, $A^0 \rightarrow b\overline{b}$ or $A^0 \rightarrow ZH_2^0$, $H_2^0 \rightarrow b\overline{b}$ in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 7 for limits on the product of cross section and branching ratio for $m_{H_2^0}$ = 0.12–1 TeV and m_{A^0} = 0.03–1 TeV. NODE=S055H2O;LINKAGE=NC

[97] SIRUNYAN 20AC search for gluon-fusion production of A^0 decaying to ZH in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 5 for limits on the product of cross section and branching ratios for m_{A^0} = 220–400 GeV. NODE=S055H2O;LINKAGE=OC

[98] SIRUNYAN 20AD search for lepton-flavor violating decays $H_2^0 \rightarrow \mu\tau$, $e\tau$ of gluon-fusion-produced H_2^0 in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 5 (9) and Table 5 (6) for limits on production cross section times branching ratio for $m_{H_2^0}$ = 0.2–0.9 TeV for the $\mu\tau$ ($e\tau$) final state. NODE=S055H2O;LINKAGE=KC

[99] SIRUNYAN 20AF search for $H_2^0/A^0 \rightarrow t\overline{t}$ with one or two charged leptons in the final state using kinematic variables in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Figs. 5 and 6 for limits on top Yukawa coupling of H_2^0 and A^0 for $m_{H_2^0}$, m_{A^0} = 0.4–0.75 TeV for various width assumptions. NODE=S055H2O;LINKAGE=MC

[100] SIRUNYAN 20AP search for the decay H or $H_2^0 \rightarrow A^0A^0 \rightarrow \mu^+\mu^-\tau^+\tau^-$ (for $m_{H_2^0}$ = 300 GeV) with boosted final-state topology in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 7 for limits on the product of production cross section (normalized to the SM) and branching ratios in the range m_{A^0} = 3.6–21 GeV, and Figs. 8 and 9 for its interpretation in terms of models with two Higgs doublets plus a singlet. NODE=S055H2O;LINKAGE=JC

[101] SIRUNYAN 20Y search for gluon-fusion and vector-boson-fusion production of H_2^0 decaying to W^+W^- in the final states $\ell\nu\ell\nu$ and $\ell\nu qq$ in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 6 for limits on the product of cross section and branching ratio for $m_{H_2^0}$ = 0.2–3 TeV. NODE=S055H2O;LINKAGE=PC

[102] SIRUNYAN 20Z search for $H_{1,2}^0$ or A^0 production in association with a $t\overline{t}$ pair, decaying to e^+e^- or $\mu^+\mu^-$, in 137 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 12 for limits on production cross section times branching ratio for $m_{H_{1,2}^0}$, m_{A^0} = 15–75 GeV and 108–340 GeV. NODE=S055H2O;LINKAGE=IC

[103] AABOUD 19A search for a narrow scalar resonance decaying to $HH \rightarrow b\overline{b}b\overline{b}$ in 27.5–36.1 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 9(a) for limits on cross section times branching ratios for $m_{H_2^0}$ = 0.26–3 TeV. NODE=S055H2O;LINKAGE=FB

[104] AABOUD 19AG search for the decay $H \rightarrow A^0 A^0 \rightarrow \mu^+ \mu^- b\overline{b}$ in 36.7 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 6 (a) for limits on the product of production cross section (normalized to the SM) and branching ratios in the range m_{A^0} = 20–60 GeV. NODE=S055H2O;LINKAGE=AC

[105] AABOUD 19O search for a scalar resonance decaying to $HH \rightarrow b\overline{b}WW^*$ in 36.1 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 12 (left) for limits on cross section times branching ratio for $m_{H_2^0}$ = 0.5–3 TeV. NODE=S055H2O;LINKAGE=VB

[106] AABOUD 19T search for a scalar resonance decaying to $HH \rightarrow WW^*WW^*$ in 36.1 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 3 for limits on cross section times branching ratio for $m_{H_2^0}$ = 260–500 GeV, assuming SM decay rates for the H. NODE=S055H2O;LINKAGE=FC

[107] AABOUD 19V combine published ATLAS data to constrain two-Higgs-doublet plus singlet pseudoscalar model with A_1^0 decaying to invisible final states. See their Fig. 19 for excluded parameter regions. NODE=S055H2O;LINKAGE=EC

[108] AABOUD 19Y search for a narrow scalar resonance produced by gluon fusion or b associated production, decaying to $\mu^+\mu^-$ in 36.1 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Figs. 4 and 5(a) for cross section limits for $m_{H_2^0}$ = 0.2–1.0 TeV. NODE=S055H2O;LINKAGE=SB

[109] AALTONEN 19 search for b associated production of a scalar particle decaying to $b\overline{b}$ in 5.4 fb^{-1} of $p\overline{p}$ collisions at $E_{\rm cm}$ = 1.96 TeV. See their Fig. 3 for limits on cross section times branching ratio for $m_{H_{1,2}^0}$ = 100–300 GeV. NODE=S055H2O;LINKAGE=XB

[110] SIRUNYAN 19 search for a narrow scalar resonance decaying to $HH \rightarrow \gamma\gamma b\overline{b}$ in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 9 (left) for limits on cross section times branching ratios for $m_{H_2^0}$ = 260–900 GeV. NODE=S055H2O;LINKAGE=CB

[111] SIRUNYAN 19AE search for a scalar resonance produced in association with a $b\overline{b}$ pair, decaying to $\tau^+\tau^-$ in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 4 for cross section limits for m_{A^0} = 25–70 GeV. NODE=S055H2O;LINKAGE=TB

[112] SIRUNYAN 19AN search for production of A_2^0 decaying to HA_1^0 followed by $H \rightarrow b\overline{b}$, $A_1^0 \rightarrow$ invisible in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV, in the mass range $m_{A_2^0}$ = 0.2–1.6 TeV, $m_{A_1^0}$ = 0.15–0.5 TeV. See their Fig. 6 for limits in terms of two-Higgs-doublet plus singlet pseudoscalar model. NODE=S055H2O;LINKAGE=CC

[113] SIRUNYAN 19AV search for a scalar resonance produced by gluon fusion or b-associated production, decaying to $ZH \rightarrow \ell^+\ell^- b\overline{b}$ ($\ell = e$, μ) or $\nu\overline{\nu}b\overline{b}$ in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 5 for cross section limits for m_{A^0} = 0.22–1.0 TeV. NODE=S055H2O;LINKAGE=YB

[114] SIRUNYAN 19B search for gluon fusion production of narrow scalar resonance with large transverse momentum, decaying to $b\overline{b}$, in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Figs. 7 and 8 for limits on cross section times branching ratio for the resonance mass of 50–350 GeV. NODE=S055H2O;LINKAGE=QB

[115] SIRUNYAN 19BB search for the decay $H_1^0 \rightarrow \gamma\gamma$ in 19.7 fb^{-1} of pp collisions at $E_{\rm cm}$ = 8 TeV and 35.9 fb^{-1} at $E_{\rm cm}$ = 13 TeV. See their Figs. 4–6 for limits on cross section times branching ratio for $m_{H_1^0}$ = 80–110 GeV (some results in Fig. 5 for $m_{H_1^0}$ = 70–110 GeV). NODE=S055H2O;LINKAGE=RB

[116] SIRUNYAN 19BD search for the decay $H \rightarrow A^0 A^0 \rightarrow \mu^+\mu^- b\overline{b}$ in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 5 for limits on the product of cross section times branching ratios in the range m_{A^0} = 20–62.5 GeV. See also their Figs. 6 and 7 for interpretation of the data in terms of models with two Higgs doublets and a singlet. NODE=S055H2O;LINKAGE=ZB

[117] SIRUNYAN 19BE combine searches for $H_2^0 \rightarrow HH$ in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV in various H decay modes, from SIRUNYAN 18A, SIRUNYAN 18AF, SIRUNYAN 18CW, SIRUNYAN 19, and SIRUNYAN 19H. See their Fig. 3 for limits on cross section times branching ratios for $m_{H_2^0}$ = 0.25–3 TeV. NODE=S055H2O;LINKAGE=UB

[118] SIRUNYAN 19BQ search for production of $H_{1,2}^0$ decaying to $A^0 A^0 \rightarrow \mu^+\mu^-\mu^+\mu^-$ in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 2 for limits on cross section times branching ratio for $m_{H_{1,2}^0}$ = 90–150 GeV, m_{A^0} = 0.25–3.55 GeV. NODE=S055H2O;LINKAGE=BC

[119] SIRUNYAN 19CR search for production of H_2^0/A^0 in gluon fusion and in association with a $b\overline{b}$ pair, decaying to $\mu^+\mu^-$ in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 6 for limits on cross section times branching ratio. NODE=S055H2O;LINKAGE=HC

[120] SIRUNYAN 19H search for a narrow scalar resonance decaying to $HH \rightarrow b\overline{b}b\overline{b}$ in 35.9 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV, where one $b\overline{b}$ pair is resolved and the other not. Limits on cross section times branching ratios for $m_{H_2^0}$ = 0.75–1.6 TeV are obtained and combined with data from SIRUNYAN 18AF. See their Fig. 5 (right). NODE=S055H2O;LINKAGE=KB

[121] AABOUD 18AA search for production of a scalar resonance decaying to $Z\gamma$, with Z decaying hadronically, in 36.1 fb^{-1} of pp collisions at $E_{\rm cm}$ = 13 TeV. See their Fig. 8(a) for limits on cross section times branching ratio for $m_{H_2^0}$ = 1.0–6.8 TeV. NODE=S055H2O;LINKAGE=TA

[122] AABOUD 18AG search for the decay $H \to A^0 A^0 \to \gamma\gamma g g$ in 36.7 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 2 and Table 6 for cross section limits in the range m_{A^0} = 20–60 GeV. NODE=S055H2O;LINKAGE=YA

[123] AABOUD 18AH search for production of an A^0 in gluon-gluon fusion and in association with a $b\overline{b}$, decaying to $Z H^0_2 \to \ell^+ \ell^- b\overline{b}$ in 36.1 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 5 for cross section limits for m_{A^0} = 230–800 GeV and $m_{H^0_2}$ = 130–700 GeV. NODE=S055H2O;LINKAGE=SA

[124] AABOUD 18AI search for production of an A^0 in gluon-gluon fusion and in association with a $b\overline{b}$, decaying to ZH in the final states $\nu\overline{\nu} b\overline{b}$ and $\ell^+ \ell^- b\overline{b}$ in 36.1 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 6 for cross section limits for m_{A^0} = 0.2–2 TeV. See also AABOUD 18CC. NODE=S055H2O;LINKAGE=RA

[125] AABOUD 18BF search for production of a heavy H^0_2 state decaying to ZZ in the final states $\ell^+ \ell^- \ell^+ \ell^-$ and $\ell^+ \ell^- \nu\overline{\nu}$ in 36.1 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 6 for upper limits on cross section times branching ratio for $m_{H^0_2}$ = 0.2–1.2 TeV assuming ggF or VBF with the NWA. See their Fig. 7 for upper limits on cross section times branching ratio for $m_{H^0_2}$ = 0.4–1.0 TeV assuming ggF, and with several assumptions on its width. NODE=S055H2O;LINKAGE=VA

[126] AABOUD 18BU search for a narrow scalar resonance decaying to $HH \to \gamma\gamma W W^*$ in 36.1 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 4 for limits on cross section times branching ratios for $m_{H^0_2}$ = 260–500 GeV. NODE=S055H2O;LINKAGE=EB

[127] AABOUD 18BX search for associated production of WH or ZH followed by the decay $H \to A^0 A^0 \to b\overline{b} b\overline{b}$ in 36.1 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 9 for limits on cross section times branching ratios for m_{A^0} = 20–60 GeV. See also their Fig. 10 for the dependence of the limit on A^0 lifetime. NODE=S055H2O;LINKAGE=PB

[128] AABOUD 18CQ search for a narrow scalar resonance decaying to $HH \to b\overline{b}\tau^+\tau^-$ in 36.1 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 2 (above) for limits on cross section times branching ratios for $m_{H^0_2}$ = 260–1000 GeV. NODE=S055H2O;LINKAGE=DB

[129] AABOUD 18F search for production of a narrow scalar resonance decaying to $W^+ W^-$ and ZZ, followed by hadronic decays of W and Z, in 36.7 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 5(c) for limits on cross section times branching ratio for $m_{H^0_2}$ = 1.2–3.0 TeV. NODE=S055H2O;LINKAGE=UA

[130] AAIJ 18AM search for gluon-fusion production of $H^0_{1,2}$ decaying to $\mu\tau$ in 2 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 2 for limits on cross section times branching ratio for $m_{H^0_{1,2}}$ = 45–195 GeV. NODE=S055H2O;LINKAGE=BB

[131] AAIJ 18AQ search for gluon-fusion production of a scalar particle A^0 decaying to $\mu^+\mu^-$ in 1.99 fb^{-1} of pp collisions at E_{cm} = 8 TeV and 0.98 fb^{-1} at E_{cm} = 7 TeV. See their Fig. 4 for limits on cross section times branching ratio for m_{A^0} = 5.5–15 GeV (using the E_{cm} = 8 TeV data set). NODE=S055H2O;LINKAGE=NB

[132] AAIJ 18AQ search for the decay $H \to A^0 A^0$, with one of the A^0 decaying to $\mu^+\mu^-$, in 1.99 fb^{-1} of pp collisions at E_{cm} = 8 TeV and 0.98 fb^{-1} at E_{cm} = 7 TeV. See their Fig. 5 (right) for limits on the product of branching ratios for m_{A^0} = 5.5–15 GeV (using the E_{cm} = 8 TeV data set). NODE=S055H2O;LINKAGE=OB

[133] SIRUNYAN 18AF search for a narrow scalar resonance decaying to $HH \to b\overline{b} b\overline{b}$ in 35.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV, where both $b\overline{b}$ pairs are not resolved. See their Fig. 9 for limits on cross section times branching ratios for $m_{H^0_2}$ = 0.75–3 TeV. NODE=S055H2O;LINKAGE=WA

[134] SIRUNYAN 18BA search for production of a heavy H^0_2 state decaying to ZZ in the final states $\ell^+ \ell^- \ell^+ \ell^-$, $\ell^+ \ell^- q\overline{q}$, and $\ell^+ \ell^- \nu\overline{\nu}$ in 35.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Figs. 10 and 11 for upper limits on cross section times branching ratio for $m_{H^0_2}$ = 0.13–3 TeV with several assumptions on its width and on the fraction of Vector-Boson-Fusion of the total production cross section. NODE=S055H2O;LINKAGE=XA

[135] SIRUNYAN 18CW search for a narrow scalar resonance decaying to $HH \to b\overline{b} b\overline{b}$ in 35.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV, where both $b\overline{b}$ pairs are resolved. See their Fig. 9 for limits on cross section times branching ratios for $m_{H^0_2}$ = 260–1200 GeV. NODE=S055H2O;LINKAGE=QA

[136] SIRUNYAN 18DK search for production of a scalar resonance decaying to $Z\gamma$, with Z decaying to $\ell^+ \ell^-$ or hadronically, in 35.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 7 for limits on cross section times branching ratio for $m_{H^0_2}$ = 0.35–4 TeV for different assumptions on the width of the resonance. NODE=S055H2O;LINKAGE=JB

[137] SIRUNYAN 18DT search for the decay $H \to A^0 A^0 \to \tau^+\tau^- b\overline{b}$ in 35.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 7 for limits on the product of branching ratios in the range m_{A^0} = 15–60 GeV. See also their Fig. 8 for interpretation of the data in terms of models with two Higgs doublets and a singlet. NODE=S055H2O;LINKAGE=LB

[138] SIRUNYAN 18DU search for production of a narrow scalar resonance decaying to $\gamma\gamma$ in 35.9 fb^{-1} (taken in 2016) of pp collisions at E_{cm} = 13 TeV. See their Fig. 3 (right) NODE=S055H2O;LINKAGE=IB

for limits on cross section times branching ratio for $m_{H_2^0}$ = 0.5–5 TeV for several values of its width-to-mass ratio.

[139] SIRUNYAN 18ED search for production of an A^0 in gluon-gluon fusion and in association with a $b\overline{b}$, decaying to ZH in the final states $\nu\overline{\nu}b\overline{b}$ or $\ell^+\ell^- b\overline{b}$ in 35.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 8 for cross section limits for m_{A^0} = 0.8–2 TeV. NODE=S055H2O;LINKAGE=AB

[140] SIRUNYAN 18EE search for the decay $H \rightarrow A^0 A^0 \rightarrow \mu^+\mu^-\tau^+\tau^-$ in 35.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 4 for limits on the product of branching ratios in the range m_{A^0} = 15–62.5 GeV, normalized to the SM production cross section. See also their Fig. 5 for interpretation of the data in terms of models with two Higgs doublets and a singlet. NODE=S055H2O;LINKAGE=MB

[141] SIRUNYAN 18F search for a narrow scalar resonance decaying to $HH \rightarrow WWb\overline{b}$ or $ZZb\overline{b}$ in the final state $\ell\ell\nu\nu b\overline{b}$ in 35.9 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 7 for limits on cross section times branching ratios for $m_{H_2^0}$ = 250–900 GeV. NODE=S055H2O;LINKAGE=LA

[142] AABOUD 17 search for production of a scalar resonance decaying to $Z\gamma$ in 3.2 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 4 for the limits on cross section times branching ratio for $m_{H_2^0}$ = 0.25–3.0 TeV. NODE=S055H2O;LINKAGE=IA

[143] AABOUD 17AP search for production of a scalar resonance decaying to $\gamma\gamma$ in 36.7 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 4(a) for limits on fiducial cross section times branching ratio for $m_{H_2^0}$ = 0.2–2.7 TeV with narrow width approximation. NODE=S055H2O;LINKAGE=BD

[144] AABOUD 17AW search for production of a scalar resonance decaying to $Z\gamma$ in 36.1 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 7 for limits on cross section times branching ratio for $m_{H_2^0}$ = 0.25–2.4 TeV. NODE=S055H2O;LINKAGE=KA

[145] KHACHATRYAN 17AZ search for the decay $H \rightarrow A^0 A^0 \rightarrow \tau^+\tau^-\tau^+\tau^-$, $\mu^+\mu^- b\overline{b}$, and $\mu^+\mu^-\tau^+\tau^-$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Figs. 4, 5, and 6 for cross section limits in the range m_{A^0} = 5–62.5 GeV. See also their Figs. 7, 8, and 9 for interpretation of the data in terms of models with two Higgs doublets and a singlet. NODE=S055H2O;LINKAGE=ZA

[146] KHACHATRYAN 17D search for production of a scalar resonance decaying to $Z\gamma$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV and 2.7 fb^{-1} at E_{cm} = 13 TeV. See their Figs. 3 and 4 for the limits on cross section times branching ratio for $m_{H_2^0}$ = 0.2–2.0 TeV. NODE=S055H2O;LINKAGE=OA

[147] KHACHATRYAN 17R search for production of a narrow scalar resonance decaying to $\gamma\gamma$ in 12.9 fb^{-1} (taken in 2016) of pp collisions at E_{cm} = 13 TeV. See their Fig. 2 for limits on cross section times branching ratio for $m_{H_2^0}$ = 0.5–4.5 TeV for several values of its width-to-mass ratio. Limits from combination with KHACHATRYAN 16M are shown in their Figs. 4 and 6. NODE=S055H2O;LINKAGE=JA

[148] SIRUNYAN 17CN search for a narrow scalar resonance decaying to $HH \rightarrow b\overline{b}\tau^+\tau^-$ in 18.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 5 (above) and Table II for limits on the cross section times branching ratios for $m_{H_2^0}$ = 0.3–1 TeV, and Fig. 6 (above) and Table III for the corresponding limits by combining with data from KHACHATRYAN 16BQ and KHACHATRYAN 15R. NODE=S055H2O;LINKAGE=NA

[149] SIRUNYAN 17Y search for production of a scalar resonance decaying to $Z\gamma$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV and 2.7 fb^{-1} at E_{cm} = 13 TeV. See their Figs. 3, 4 and Table 3 for limits on cross section times branching ratio for $m_{H_2^0}$ = 0.7–3.0 TeV, and Fig. 5 for the corresponding limits for $m_{H_2^0}$ = 0.2–3.0 TeV from combination with KHACHATRYAN 17D data. NODE=S055H2O;LINKAGE=MA

[150] AABOUD 16AB search for associated production of WH with the decay $H \rightarrow A^0 A^0 \rightarrow b\overline{b}b\overline{b}$ in 3.2 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 8 for limits on cross section times branching ratios for m_{A^0} = 20–60 GeV. NODE=S055H2O;LINKAGE=FA

[151] AABOUD 16AE search for production of a narrow scalar resonance decaying to W^+W^- and ZZ in 3.2 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 4 for limits on cross section times branching ratio for $m_{H_2^0}$ = 0.5–3 TeV. NODE=S055H2O;LINKAGE=EA

[152] AABOUD 16H search for production of a scalar resonance decaying to $\gamma\gamma$ in 3.2 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 12 for limits on cross section times branching ratio for $m_{H_2^0}$ = 0.2–2 TeV with different assumptions on the width. NODE=S055H2O;LINKAGE=DA

[153] AABOUD 16I search for a narrow scalar resonance decaying to $HH \rightarrow b\overline{b}b\overline{b}$ in 3.2 fb^{-1} of pp collisions at E_{cm} = 13 TeV. See their Fig. 10(c) for limits on cross section times branching ratios for $m_{H_2^0}$ = 0.5–3 TeV. NODE=S055H2O;LINKAGE=T

[154] AAD 16AX search for production of a heavy H state decaying to ZZ in the final states $\ell^+\ell^-\ell^+\ell^-$, $\ell^+\ell^-\nu\overline{\nu}$, $\ell^+\ell^- q\overline{q}$, and$\nu\overline{\nu}q\overline{q}$ in 20.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig.12 for upper limits on $\sigma(H)$ B($H \rightarrow ZZ$) for m_H ranging from 140 GeV to 1000 GeV. NODE=S055H2O;LINKAGE=R

[155] AAD 16C search for production of a heavy H state decaying to W^+W^- in the final states $\ell\nu\ell\nu$ and $\ell\nu qq$ in 20.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Figs. NODE=S055H2O;LINKAGE=K

12, 13, and 16 for upper limits on $\sigma(H)$ B($H \to W^+ W^-$) for m_H ranging from 300 GeV to 1000 or 1500 GeV with various assumptions on the total width of H.

[156] AAD 16L search for the decay $H \to A^0 A^0 \to \gamma\gamma\gamma\gamma$ in 20.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 4 (upper right) for limits on cross section times branching ratios (normalized to the SM H cross section) for m_{A^0} = 10–60 GeV. NODE=S055H2O;LINKAGE=Z

[157] AAD 16L search for the decay $H_2^0 \to A^0 A^0 \to \gamma\gamma\gamma\gamma$ in 20.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 4 (lower right) for limits on cross section times branching ratios for $m_{H_2^0}$ = 600 GeV and m_{A^0} = 10–245 GeV, and Table 5 for limits for $m_{H_2^0}$= 300 and 900 GeV. NODE=S055H2O;LINKAGE=BA

[158] AALTONEN 16C search for electroweak associated production of $H_1^0 H^\pm$ followed by the decays $H^\pm \to H_1^0 W^*$, $H_1^0 \to \gamma\gamma$ for $m_{H_1^0}$ = 10–105 GeV and $m_{H^\pm}$ = 30–300 GeV. See their Fig. 3 for excluded parameter region in a two-doublet model in which H_1^0 has no direct decay to fermions. NODE=S055H2O;LINKAGE=S

[159] KHACHATRYAN 16BG search for a narrow scalar resonance decaying to $HH \to b\overline{b}b\overline{b}$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 6 for limits on the cross section times branching ratios for $m_{H_2^0}$ = 1.15–3 TeV. NODE=S055H2O;LINKAGE=V

[160] KHACHATRYAN 16BQ search for a resonance decaying to $HH \to \gamma\gamma b\overline{b}$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 9 for limits on the cross section times branching ratios for $m_{H_2^0}$ = 0.26–1.1 TeV. NODE=S055H2O;LINKAGE=PA

[161] KHACHATRYAN 16F search for the decay $H \to H_1^0 H_1^0 \to \tau^+\tau^-\tau^+\tau^-$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 8 for cross section limits for $m_{H_1^0}$ = 4–8 GeV. NODE=S055H2O;LINKAGE=P

[162] KHACHATRYAN 16M search for production of a narrow resonance decaying to $\gamma\gamma$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV and 3.3 fb^{-1} at E_{cm} = 13 TeV. See their Fig. 3 (top) for limits on cross section times branching ratio for $m_{H_2^0}$ = 0.5–4 TeV. NODE=S055H2O;LINKAGE=CA

[163] KHACHATRYAN 16P search for gluon fusion production of an H_2^0 decaying to $HH \to b\overline{b}\tau^+\tau^-$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 8 (lower right) for cross section limits for $m_{H_2^0}$ = 260–350 GeV. NODE=S055H2O;LINKAGE=X

[164] KHACHATRYAN 16P search for gluon fusion production of an A^0 decaying to $ZH \to \ell^+\ell^-\tau^+\tau^-$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 10 for cross section limits for $m_{H_2^0}$ = 220–350 GeV. NODE=S055H2O;LINKAGE=Y

[165] AAD 15BK search for production of a heavy H_2^0 decaying to HH in the final state $b\overline{b}b\overline{b}$ in 19.5 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 14(c) for $\sigma(H_2^0)$ B($H_2^0 \to HH$) for $m_{H_2^0}$ = 500–1500 GeV with $\Gamma_{H_2^0}$ = 1 GeV. NODE=S055H2O;LINKAGE=M

[166] AAD 15BZ search for the decay $H \to A^0 A^0 \to \mu^+\mu^-\tau^+\tau^-$ (m_H = 125 GeV) in 20.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 6 for limits on cross section times branching ratio for m_{A^0} = 3.7–50 GeV. NODE=S055H2O;LINKAGE=H

[167] AAD 15BZ search for a state H_2^0 via the decay $H_2^0 \to A^0 A^0 \to \mu^+\mu^-\tau^+\tau^-$ in 20.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 6 for limits on cross section times branching ratio for $m_{H_2^0}$ = 100–500 GeV and m_{A^0} = 5 GeV. NODE=S055H2O;LINKAGE=I

[168] AAD 15CE search for production of a heavy H_2^0 decaying to HH in the final states $b\overline{b}\tau^+\tau^-$ and $\gamma\gamma W W^*$ in 20.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV and combine with data from AAD 15H and AAD 15BK. A limit $\sigma(H_2^0)$ B($H_2^0 \to HH$) $<$ 2.1–0.011 pb (95% CL) is given for $m_{H_2^0}$ = 260–1000 GeV. See their Fig. 6. NODE=S055H2O;LINKAGE=O

[169] AAD 15H search for production of a heavy H_2^0 decaying to HH in the finalstate $\gamma\gamma b\overline{b}$ in 20.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV.A limit of $\sigma(H_2^0)$ B($H_2^0 \to HH$) $<$ 3.5–0.7 pb is given for $m_{H_2^0}$ = 260–500 GeV at 95% CL. See their Fig. 3. NODE=S055H2O;LINKAGE=N

[170] AAD 15S search for production of A^0 decaying to $ZH \to \ell^+\ell^- b\overline{b}$, $\nu\overline{\nu}b\overline{b}$ and $\ell^+\ell^-\tau^+\tau^-$ in 20.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 3 for cross section limits for m_{A^0} = 200–1000 GeV. NODE=S055H2O;LINKAGE=J

[171] KHACHATRYAN 15AW search for production of a heavy state H_2^0 of an electroweak singlet extension of the Standard Model via the decays of H_2^0 to W^+W^- and ZZ in up to 5.1 fb^{-1} of pp collisions at E_{cm} = 7 TeV and up to 19.7 fb^{-1} at E_{cm} = 8 TeV in the range $m_{H_2^0}$ = 145–1000 GeV. See their Figs. 8 and 9 for limits in the parameter space of the model. NODE=S055H2O;LINKAGE=Q

[172] KHACHATRYAN 15BB search for production of a resonance H decaying to $\gamma\gamma$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 7 for limits on cross section times branching ratio for m_H = 150–850 GeV. NODE=S055H2O;LINKAGE=L

[173] KHACHATRYAN 15N search for production of A^0 decaying to $ZH \to \ell^+\ell^- b\overline{b}$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 3 for limits on cross section times branching ratios for m_{A^0} = 225–600 GeV. NODE=S055H2O;LINKAGE=G

[174] KHACHATRYAN 15O search for production of a high-mass narrow resonance A^0 decaying to $ZH \to q\overline{q}\tau^+\tau^-$ in 19.7 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 6 for limits on cross section times branching ratios for m_{A^0} = 800–2500 GeV. NODE=S055H2O;LINKAGE=F

[175] KHACHATRYAN 15R search for a narrow scalar resonance decaying to $HH \to b\overline{b}b\overline{b}$ in 17.9 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 5 (top) for limits on cross section times branching ratios for $m_{H_2^0}$ = 0.27–1.1 TeV. NODE=S055H2O;LINKAGE=GA

[176] AAD 14AP search for a second H state decaying to $\gamma\gamma$ in addition to the state at about 125 GeV in 20.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Fig. 4 for limits on cross section times branching ratio for m_H = 65–600 GeV. NODE=S055H2O;LINKAGE=C

[177] AAD 14M search for the decay cascade $H_2^0 \to H^\pm W^\mp \to H W^\pm W^\mp$, H decaying to $b\overline{b}$ in 20.3 fb^{-1} of pp collisions at E_{cm} = 8 TeV. See their Table III for limits on cross section times branching ratio for $m_{H_2^0}$= 325–1025 GeV and m_{H^+}= 225–925 GeV. NODE=S055H2O;LINKAGE=D

[178] CHATRCHYAN 14G search for a second H state decaying to $WW^{(*)}$ in addition to the observed signal at about 125 GeV using 4.9 fb^{-1} of pp collisions at E_{cm} = 7 TeV and 19.4 fb^{-1} at E_{cm} = 8 TeV. See their Fig. 21 (right) for cross section limits in the mass range 110–600 GeV. NODE=S055H2O;LINKAGE=B

[179] KHACHATRYAN 14P search for a second H state decaying to $\gamma\gamma$ in addition to the observed signal at about 125 GeV using 5.1 fb^{-1} of pp collisions at E_{cm} = 7 TeV and 19.7 fb^{-1} at E_{cm} = 8 TeV. See their Figs. 27 and 28 for cross section limits in the mass range 110–150 GeV. NODE=S055H2O;LINKAGE=A

[180] AALTONEN 13P search for production of a heavy Higgs boson H'^0 that decays into a charged Higgs boson $H^\pm$ and a lighter Higgs boson H via the decay chain $H'^0 \to H^\pm W^\mp$, $H^\pm \to W^\pm H$, $H \to b\overline{b}$ in the final state $\ell\nu$ plus 4 jets in 8.7 fb^{-1} of $p\overline{p}$ collisions at E_{cm} = 1.96 TeV. See their Fig. 4 for limits on cross section times branching ratio in the $m_{H^\pm}-m_{H'^0}$ plane for m_H = 126 GeV. NODE=S055H2O;LINKAGE=EN

[181] CHATRCHYAN 13BJ search for H production in the decay chain $H \to A^0 A^0$, $A^0 \to \mu^+\mu^-$ in 5.3 fb^{-1} of pp collisions at E_{cm} = 7 TeV. See their Fig. 2 for limits on cross section times branching ratio. NODE=S055H2O;LINKAGE=AT

[182] AALTONEN 11P search in 2.7 fb^{-1} of $p\overline{p}$ collisions at E_{cm} = 1.96 TeV for the decay chain $t \to bH^+$, $H^+ \to W^+ A^0$, $A^0 \to \tau^+\tau^-$ with m_{A^0} between 4 and 9 GeV. See their Fig. 4 for limits on B($t \to bH^+$) for 90 < m_{H^+} < 160 GeV. NODE=S055H2O;LINKAGE=A5

[183] ABBIENDI 10 search for $e^+e^- \to ZH$ with the decay chain $H \to \widetilde{\chi}_1^0\widetilde{\chi}_2^0$, $\widetilde{\chi}_2^0 \to \widetilde{\chi}_1^0$ + (γ or Z^*), when $\widetilde{\chi}_1^0$ and $\widetilde{\chi}_2^0$ are nearly degenerate. For a mass difference of 2 (4) GeV, a lower limit on m_H of 108.4 (107.0) GeV (95% CL) is obtained for SM ZH cross section and B($H \to \widetilde{\chi}_1^0\widetilde{\chi}_2^0$) = 1. NODE=S055H2O;LINKAGE=IE

[184] SCHAEL 10 search for the process $e^+e^- \to HZ$ followed by the decay chain $H \to A^0 A^0 \to \tau^+\tau^-\tau^+\tau^-$ with $Z \to \ell^+\ell^-$, $\nu\overline{\nu}$ at E_{cm} = 183–209 GeV. For a HZZ coupling equal to the SM value, B($H \to A^0 A^0$) = B($A^0 \to \tau^+\tau^-$) = 1, and m_{A^0} = 4–10 GeV, m_H up to 107 GeV is excluded at 95% CL. NODE=S055H2O;LINKAGE=SC

[185] ABAZOV 09V search for H production followed by the decay chain $H \to A^0 A^0 \to \mu^+\mu^-\mu^+\mu^-$ or $\mu^+\mu^-\tau^+\tau^-$ in 4.2 fb^{-1} of $p\overline{p}$ collisions at E_{cm} = 1.96 TeV. See their Fig. 3 for limits on $\sigma(H)$·B($H \to A^0 A^0$) for m_{A^0} = 3.6–19 GeV. NODE=S055H2O;LINKAGE=VO

[186] ABBIENDI 05A search for $e^+e^- \to H_1^0 A^0$ in general Type-II two-doublet models, with decays H_1^0, $A^0 \to q\overline{q}$, gg, $\tau^+\tau^-$, and $H_1^0 \to A^0 A^0$. NODE=S055H2O;LINKAGE=AN

[187] ABBIENDI 04K search for $e^+e^- \to HZ$ with H decaying to two jets of any flavor including gg. The limit is for SM production cross section with B($H \to jj$) = 1. NODE=S055H2O;LINKAGE=AE

[188] ABDALLAH 04 consider the full combined LEP and LEP2 datasets to set limits on the Higgs coupling to W or Z bosons, assuming SM decays of the Higgs. Results in Fig. 26. NODE=S055H2O;LINKAGE=AD

[189] ACHARD 04B search for $e^+e^- \to HZ$ with H decaying to $b\overline{b}$, $c\overline{c}$, or gg. The limit is for SM production cross section with B($H \to jj$) = 1. NODE=S055H2O;LINKAGE=AR

[190] ACHARD 04F search for H with anomalous coupling to gauge boson pairs in the processes $e^+e^- \to H\gamma$, $e^+e^- H$, HZ with decays $H \to f\overline{f}$, $\gamma\gamma$, $Z\gamma$, and $W^* W$ at E_{cm} = 189–209 GeV. See paper for limits. NODE=S055H2O;LINKAGE=AA

[191] ABBIENDI 03F search for $H \to$ anything in $e^+e^- \to HZ$, using the recoil mass spectrum of $Z \to e^+e^-$ or $\mu^+\mu^-$. In addition, it searched for $Z \to \nu\overline{\nu}$ and $H \to e^+e^-$ or photons. Scenarios with large width or continuum H mass distribution are considered. See their Figs. 11–14 for the results. NODE=S055H2O;LINKAGE=A3

[192] ABBIENDI 03G search for $e^+e^- \to H_1^0 Z$ followed by $H_1^0 \to A^0 A^0$, $A^0 \to c\overline{c}$, gg, or $\tau^+\tau^-$ in the region $m_{H_1^0}$ = 45-86 GeV and m_{A^0} = 2-11 GeV. See their Fig. 7 for the limits. NODE=S055H2O;LINKAGE=AI

[193] Search for associated production of a $\gamma\gamma$ resonance with a Z boson, followed by $Z \rightarrow q\overline{q}$, $\ell^+\ell^-$, or $\nu\overline{\nu}$, at $E_{cm} \leq 209$ GeV. The limit is for a H with SM production cross section and B($H \rightarrow f\overline{f}$)=0 for all fermions f. NODE=S055H2O;LINKAGE=HA

[194] For B($H \rightarrow \gamma\gamma$)=1, $m_H > 113.1$ GeV is obtained. NODE=S055H2O;LINKAGE=LH

[195] HEISTER 02M search for $e^+e^- \rightarrow HZ$, assuming that H decays to $q\overline{q}$, gg, or $\tau^+\tau^-$ only. The limit assumes SM production cross section. NODE=S055H2O;LINKAGE=MH

[196] ABBIENDI 01E search for neutral Higgs bosons in general Type-II two-doublet models, at $E_{cm} \leq 189$ GeV. In addition to usual final states, the decays H_1^0, $A^0 \rightarrow q\overline{q}$, gg are searched for. See their Figs. 15,16 for excluded regions. NODE=S055H2O;LINKAGE=EK

[197] ACCIARRI 00R search for $e^+e^- \rightarrow H\gamma$ with $H \rightarrow b\overline{b}$, $Z\gamma$, or $\gamma\gamma$. See their Fig. 3 for limits on $\sigma \cdot$ B. Explicit limits within an effective interaction framework are also given, for which the Standard Model Higgs search results are used in addition. NODE=S055H2O;LINKAGE=PE

[198] ACCIARRI 00R search for the two-photon type processes $e^+e^- \rightarrow e^+e^- H$ with $H \rightarrow b\overline{b}$ or $\gamma\gamma$. See their Fig. 4 for limits on $\Gamma(H \rightarrow \gamma\gamma)\cdot$B($H \rightarrow \gamma\gamma$ or $b\overline{b}$) for m_H=70–170 GeV. NODE=S055H2O;LINKAGE=PF

[199] GONZALEZ-GARCIA 98B use DØ limit for $\gamma\gamma$ events with missing E_T in $p\overline{p}$ collisions (ABBOTT 98) to constrain possible ZH or WH production followed by unconventional $H \rightarrow \gamma\gamma$ decay which is induced by higher-dimensional operators. See their Figs. 1 and 2 for limits on the anomalous couplings. NODE=S055H2O;LINKAGE=W

[200] KRAWCZYK 97 analyse the muon anomalous magnetic moment in a two-doublet Higgs model (with type II Yukawa couplings) assuming no $H_1^0 ZZ$ coupling and obtain $m_{H_1^0} \gtrsim$ 5 GeV or $m_{A^0} \gtrsim 5$ GeV for $\tan\beta > 50$. Other Higgs bosons are assumed to be much heavier. NODE=S055H2O;LINKAGE=U

[201] ALEXANDER 96H give B($Z \rightarrow H\gamma$)$\times$B($H \rightarrow q\overline{q}$) < 1–4×10^{-5} (95%CL) and B($Z \rightarrow H\gamma$)$\times$B($H \rightarrow b\overline{b}$) < 0.7–2×10^{-5} (95%CL) in the range $20 < m_H < 80$ GeV. NODE=S055H2O;LINKAGE=O2

Electroweak Constraints on the Standard Model Higgs Boson Mass

NODE=S055HEW

Here we list constraints on the mass of the Higgs boson derived from fits to precision electroweak observables, assuming the minimal Standard Model with a doublet Higgs field and three generations of fermions.

NODE=S055HEW

NODE=S055HEW

VALUE (GeV)	*DOCUMENT ID*		*TECN*
$\mathbf{90^{+21}_{-18}}$	[1] HALLER	18	RVUE
• • • We do not use the following data for averages, fits, limits, etc. • • •			
91^{+30}_{-23}	[2] BAAK	12	RVUE
94^{+25}_{-22}	[3] BAAK	12A	RVUE
91^{+31}_{-24}	[4] ERLER	10A	RVUE
129^{+74}_{-49}	[5] LEP-SLC	06	RVUE

[1] HALLER 18 make Standard Model fits to Z and neutral current parameters, m_t, m_W, and Γ_W measurements available in 2018. The direct mass measurement at the LHC is not used in the fit. NODE=S055HEW;LINKAGE=W

[2] BAAK 12 make Standard Model fits to Z and neutral current parameters, m_t, m_W, and Γ_W measurements available in 2010 (using also preliminary data). The quoted result is obtained from a fit that does not include the limit from the direct Higgs searches. The result including direct search data from LEP2, the Tevatron and the LHC is 120^{+12}_{-5} GeV. NODE=S055HEW;LINKAGE=BA

[3] BAAK 12A make Standard Model fits to Z and neutral current parameters, m_t, m_W, and Γ_W measurements available in 2012 (using also preliminary data). The quoted result is obtained from a fit that does not include the measured mass value of the signal observed at the LHC and also no limits from direct Higgs searches. NODE=S055HEW;LINKAGE=BK

[4] ERLER 10A makes Standard Model fits to Z and neutral current parameters, m_t, m_W measurements available in 2009 (using also preliminary data). The quoted result is obtained from a fit that does not include the limits from the direct Higgs searches. With direct search data from LEP2 and Tevatron added to the fit, the 90% CL (99% CL) interval is 115–148 (114–197) GeV. NODE=S055HEW;LINKAGE=ER

[5] LEP-SLC 06 make Standard Model fits to Z parameters from LEP/SLC and m_t, m_W, and Γ_W measurements available in 2005 with $\Delta\alpha^{(5)}_{\rm had}(m_Z) = 0.02758 \pm 0.00035$. The 95% CL limit is 285 GeV. NODE=S055HEW;LINKAGE=LE

SEARCHES FOR NEUTRAL HIGGS BOSONS REFERENCES

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AAD	25AT	PL B868 139671	G. Aad *et al.*	(ATLAS Collab.)	REFID=63663
AAD	25AU	PL B870 139843	G. Aad *et al.*	(ATLAS Collab.)	REFID=63666
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AAD	25O	JHEP 2501 053	G. Aad *et al.*	(ATLAS Collab.)	REFID=63426
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AAD	24CA	JHEP 2411 047	G. Aad *et al.*	(ATLAS Collab.)	REFID=63135
AAD	24CB	JHEP 2411 097	G. Aad *et al.*	(ATLAS Collab.)	REFID=63136
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AABOUD	19O	JHEP 1904 092	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59672
AABOUD	19T	JHEP 1905 124	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59684
AABOUD	19V	JHEP 1905 142	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59686
AABOUD	19Y	JHEP 1907 117	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59698
AALTONEN	19	PR D99 052001	T. Aaltonen *et al.*	(CDF Collab.)	REFID=59838
BAGNASCHI	19	EPJ C79 617	E. Bagnaschi *et al.*		REFID=62642
SIRUNYAN	19	PL B788 7	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59412
SIRUNYAN	19AE	JHEP 1905 210	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59690
SIRUNYAN	19AN	EPJ C79 280	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59716
SIRUNYAN	19AV	EPJ C79 564	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59733
SIRUNYAN	19B	PR D99 012005	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59516
SIRUNYAN	19BB	PL B793 320	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59754
SIRUNYAN	19BD	PL B795 398	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59759
SIRUNYAN	19BE	PRL 122 121803	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59768
SIRUNYAN	19BQ	PL B796 131	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59930
SIRUNYAN	19CR	PL B798 134992	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=60137
SIRUNYAN	19H	JHEP 1901 040	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59630
AABOUD	18AA	PR D98 032015	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58981
AABOUD	18AG	PL B782 750	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59030
AABOUD	18AH	PL B783 392	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59037
AABOUD	18AI	JHEP 1803 174	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59080
Also		JHEP 1811 051 (errat.)	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59360
AABOUD	18AP	JHEP 1806 166	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59107
AABOUD	18BF	EPJ C78 293	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59172
AABOUD	18BU	EPJ C78 1007	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59333
AABOUD	18BX	JHEP 1810 031	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59349
AABOUD	18CC	JHEP 1811 051 (errat.)	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59360
AABOUD	18CE	JHEP 1812 039	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59369
AABOUD	18CQ	PRL 121 191801	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59529
AABOUD	18CW	JHEP 1811 040	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59567
AABOUD	18F	PL B777 91	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58626
AABOUD	18G	JHEP 1801 055	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58788
AAIJ	18AM	EPJ C78 1008	R. Aaij *et al.*	(LHCb Collab.)	REFID=59334
AAIJ	18AQ	JHEP 1809 147	R. Aaij *et al.*	(LHCb Collab.)	REFID=59345
HALLER	18	EPJ C78 675	J. Haller *et al.*	(Gfitter Group)	REFID=59193
SIRUNYAN	18A	PL B778 101	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=58627
SIRUNYAN	18AF	PL B781 244	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59016
SIRUNYAN	18BA	JHEP 1806 127	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59111
Also		JHEP 1903 128 (errat.)	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59661
SIRUNYAN	18BP	JHEP 1808 113	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59143
SIRUNYAN	18CW	JHEP 1808 152	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59249
SIRUNYAN	18CX	JHEP 1809 007	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59250
SIRUNYAN	18DK	JHEP 1809 148	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59346
SIRUNYAN	18DT	PL B785 462	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59403
SIRUNYAN	18DU	PR D98 092001	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59469
SIRUNYAN	18ED	JHEP 1811 172	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59566
SIRUNYAN	18EE	JHEP 1811 018	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59568
SIRUNYAN	18F	JHEP 1801 054	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=58787
AABOUD	17	PL B764 11	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57699
AABOUD	17AN	PRL 119 191803	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58276
AABOUD	17AP	PL B775 105	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58296
AABOUD	17AW	JHEP 1710 112	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58335
KHACHATRY...	17AZ	JHEP 1710 076	V. Khachatryan *et al.*	(CMS Collab.)	REFID=58336
KHACHATRY...	17D	JHEP 1701 076	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57750
KHACHATRY...	17R	PL B767 147	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57884
SIRUNYAN	17AX	JHEP 1711 010	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=58348
SIRUNYAN	17CN	PR D96 072004	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=58658
SIRUNYAN	17Y	PL B772 363	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=58233
AABOUD	16AA	EPJ C76 585	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57677
AABOUD	16AB	EPJ C76 605	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57678
AABOUD	16AE	JHEP 1609 173	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57729
AABOUD	16H	JHEP 1609 001	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57352
AABOUD	16I	PR D94 052002	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57426
AAD	16AX	EPJ C76 45	G. Aad *et al.*	(ATLAS Collab.)	REFID=57360
AAD	16C	JHEP 1601 032	G. Aad *et al.*	(ATLAS Collab.)	REFID=57024
AAD	16L	EPJ C76 210	G. Aad *et al.*	(ATLAS Collab.)	REFID=57156
AALTONEN	16C	PR D93 112010	T. Aaltonen *et al.*	(CDF Collab.)	REFID=57296
ABLIKIM	16E	PR D93 052005	M. Ablikim *et al.*	(BESIII Collab.)	REFID=57265
KHACHATRY...	16A	PL B752 221	V. Khachatryan *et al.*	(CMS Collab.)	REFID=56961
KHACHATRY...	16BG	EPJ C76 371	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57376
KHACHATRY...	16BQ	PR D94 052012	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57433
KHACHATRY...	16F	JHEP 1601 079	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57022
KHACHATRY...	16M	PRL 117 051802	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57196
KHACHATRY...	16P	PL B755 217	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57209
KHACHATRY...	16W	PL B758 296	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57228
KHACHATRY...	16Z	PL B759 369	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57236

AAD	15BD	EPJ C75 337	G. Aad *et al.*	(ATLAS Collab.)	REFID=56671
AAD	15BH	EPJ C75 299	G. Aad *et al.*	(ATLAS Collab.)	REFID=56675
Also		EPJ C75 408 (errat.)	G. Aad *et al.*	(ATLAS Collab.)	REFID=57177
AAD	15BK	EPJ C75 412	G. Aad *et al.*	(ATLAS Collab.)	REFID=56678
AAD	15BZ	PR D92 052002	G. Aad *et al.*	(ATLAS Collab.)	REFID=56879
AAD	15CE	PR D92 092004	G. Aad *et al.*	(ATLAS Collab.)	REFID=56909
AAD	15H	PRL 114 081802	G. Aad *et al.*	(ATLAS Collab.)	REFID=56440
AAD	15S	PL B744 163	G. Aad *et al.*	(ATLAS Collab.)	REFID=56504
KHACHATRY...	15AW	JHEP 1510 144	V. Khachatryan *et al.*	(CMS Collab.)	REFID=56862
KHACHATRY...	15AY	JHEP 1511 071	V. Khachatryan *et al.*	(CMS Collab.)	REFID=56866
KHACHATRY...	15BB	PL B750 494	V. Khachatryan *et al.*	(CMS Collab.)	REFID=56930
KHACHATRY...	15N	PL B748 221	V. Khachatryan *et al.*	(CMS Collab.)	REFID=56527
KHACHATRY...	15O	PL B748 255	V. Khachatryan *et al.*	(CMS Collab.)	REFID=56528
KHACHATRY...	15R	PL B749 560	V. Khachatryan *et al.*	(CMS Collab.)	REFID=56531
LEES	15H	PR D91 071102	J.P. Lees *et al.*	(BABAR Collab.)	REFID=56561
AAD	14AP	PRL 113 171801	G. Aad *et al.*	(ATLAS Collab.)	REFID=56113
AAD	14AW	JHEP 1411 056	G. Aad *et al.*	(ATLAS Collab.)	REFID=56169
AAD	14BA	JHEP 1411 088	G. Aad *et al.*	(ATLAS Collab.)	REFID=56202
AAD	14M	PR D89 032002	G. Aad *et al.*	(ATLAS Collab.)	REFID=55784
AAD	14O	PRL 112 201802	G. Aad *et al.*	(ATLAS Collab.)	REFID=55849
CHATRCHYAN	14B	EPJ C74 2980	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=55703
CHATRCHYAN	14G	JHEP 1401 096	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=55713
KHACHATRY...	14M	JHEP 1410 160	V. Khachatryan *et al.*	(CMS Collab.)	REFID=56160
KHACHATRY...	14P	EPJ C74 3076	V. Khachatryan *et al.*	(CMS Collab.)	REFID=56183
KHACHATRY...	14Q	PR D90 112013	V. Khachatryan *et al.*	(CMS Collab.)	REFID=56287
AAD	13AG	PL B721 32	G. Aad *et al.*	(ATLAS Collab.)	REFID=55073
AAD	13AT	NJP 15 043009	G. Aad *et al.*	(ATLAS Collab.)	REFID=55271
AAD	13O	JHEP 1302 095	G. Aad *et al.*	(ATLAS Collab.)	REFID=54933
AAIJ	13T	JHEP 1305 132	R. Aaij *et al.*	(LHCb Collab.)	REFID=55030
AALTONEN	13K	PR D88 052012	T. Aaltonen *et al.*	(CDF Collab.)	REFID=55190
AALTONEN	13L	PR D88 052013	T. Aaltonen *et al.*	(CDF Collab.)	REFID=55191
AALTONEN	13M	PR D88 052014	T. Aaltonen *et al.*	(CDF and D0 Collabs.)	REFID=55192
AALTONEN	13P	PRL 110 121801	T. Aaltonen *et al.*	(CDF Collab.)	REFID=55197
ABAZOV	13G	PR D88 052006	V.M. Abazov *et al.*	(D0 Collab.)	REFID=55184
ABAZOV	13H	PR D88 052007	V.M. Abazov *et al.*	(D0 Collab.)	REFID=55185
ABAZOV	13I	PR D88 052008	V.M. Abazov *et al.*	(D0 Collab.)	REFID=55186
ABAZOV	13J	PR D88 052009	V.M. Abazov *et al.*	(D0 Collab.)	REFID=55187
ABAZOV	13L	PR D88 052011	V.M. Abazov *et al.*	(D0 Collab.)	REFID=55189
CARENA	13	EPJ C73 2552	M. Carena *et al.*		REFID=55673
CHATRCHYAN	13AG	PL B722 207	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=55074
CHATRCHYAN	13AL	PL B725 36	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=55091
CHATRCHYAN	13BJ	PL B726 564	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=55435
LEES	13C	PR D87 031102	J.P. Lees *et al.*	(BABAR Collab.)	REFID=54949
LEES	13L	PR D88 031701	J.P. Lees *et al.*	(BABAR Collab.)	REFID=55167
LEES	13R	PR D88 071102	J.P. Lees *et al.*	(BABAR Collab.)	REFID=55451
AAD	12AI	PL B716 1	G. Aad *et al.*	(ATLAS Collab.)	REFID=54198
AAD	12AQ	PRL 108 251801	G. Aad *et al.*	(ATLAS Collab.)	REFID=54226
AAD	12N	EPJ C72 2157	G. Aad *et al.*	(ATLAS Collab.)	REFID=54130
AALTONEN	12AB	PR D85 092001	T. Aaltonen *et al.*	(CDF Collab.)	REFID=54367
AALTONEN	12AN	PL B717 173	T. Aaltonen *et al.*	(CDF Collab.)	REFID=54602
AALTONEN	12AQ	PR D86 091101	T. Aaltonen *et al.*	(CDF and D0 Collabs.)	REFID=54701
AALTONEN	12U	PR D85 012007	T. Aaltonen *et al.*	(CDF Collab.)	REFID=54360
AALTONEN	12X	PR D85 032005	T. Aaltonen *et al.*	(CDF Collab.)	REFID=54363
ABAZOV	12G	PL B710 569	V.M. Abazov *et al.*	(D0 Collab.)	REFID=54162
ABLIKIM	12	PR D85 092012	M. Ablikim *et al.*	(BESIII Collab.)	REFID=54265
BAAK	12	EPJ C72 2003	M. Baak *et al.*	(Gfitter Group)	REFID=54138
BAAK	12A	EPJ C72 2205	M. Baak *et al.*	(Gfitter Group)	REFID=54615
CHATRCHYAN	12AO	JHEP 1209 111	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54571
CHATRCHYAN	12C	JHEP 1203 081	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54087
CHATRCHYAN	12D	JHEP 1204 036	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54088
CHATRCHYAN	12E	PL B710 91	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54093
CHATRCHYAN	12G	PL B710 403	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54095
CHATRCHYAN	12H	PRL 108 111804	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54096
CHATRCHYAN	12I	JHEP 1203 040	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54097
CHATRCHYAN	12K	PL B713 68	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54178
CHATRCHYAN	12N	PL B716 30	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54181
CHATRCHYAN	12V	PRL 109 121801	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54253
AALTONEN	11P	PRL 107 031801	T. Aaltonen *et al.*	(CDF Collab.)	REFID=16451
ABAZOV	11K	PL B698 97	V.M. Abazov *et al.*	(D0 Collab.)	REFID=16479
ABAZOV	11W	PRL 107 121801	V.M. Abazov *et al.*	(D0 Collab.)	REFID=53816
ABOUZAID	11A	PRL 107 201803	E. Abouzaid *et al.*	(KTeV Collab.)	REFID=53842
DEL-AMO-SA...	11J	PRL 107 021804	P. del Amo Sanchez *et al.*	(BABAR Collab.)	REFID=16495
LEES	11H	PRL 107 221803	J.P. Lees *et al.*	(BABAR Collab.)	REFID=53877
ABBIENDI	10	PL B682 381	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=53163
ANDREAS	10	JHEP 1008 003	S. Andreas *et al.*	(DESY)	REFID=53623
ERLER	10A	PR D81 051301	J. Erler	(UNAM)	REFID=53389
HYUN	10	PRL 105 091801	H.J. Hyun *et al.*	(BELLE Collab.)	REFID=53372
SCHAEL	10	JHEP 1005 049	S. Schael *et al.*	(ALEPH Collab.)	REFID=53342
AALTONEN	09AB	PRL 103 061803	T. Aaltonen *et al.*	(CDF Collab.)	REFID=52933
AALTONEN	09AR	PRL 103 201801	T. Aaltonen *et al.*	(CDF Collab.)	REFID=53081
ABAZOV	09V	PRL 103 061801	V.M. Abazov *et al.*	(D0 Collab.)	REFID=52924
AUBERT	09P	PRL 103 181801	B. Aubert *et al.*	(BABAR Collab.)	REFID=53062
AUBERT	09Z	PRL 103 081803	B. Aubert *et al.*	(BABAR Collab.)	REFID=52930
TUNG	09	PRL 102 051802	Y.C. Tung *et al.*	(KEK E391a Collab.)	REFID=52872
ABAZOV	08U	PRL 101 051801	V.M. Abazov *et al.*	(D0 Collab.)	REFID=52399
ABDALLAH	08B	EPJ C54 1	J. Abdallah *et al.*	(DELPHI Collab.)	REFID=52480
Also		EPJ C56 165 (errat.)	J. Abdallah *et al.*	(DELPHI Collab.)	REFID=52483
LOVE	08	PRL 101 151802	W. Love *et al.*	(CLEO Collab.)	REFID=52565
ABBIENDI	07	EPJ C49 457	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=51729
BESSON	07	PRL 98 052002	D. Besson *et al.*	(CLEO Collab.)	REFID=51620
SCHAEL	07	EPJ C49 439	S. Schael *et al.*	(ALEPH Collab.)	REFID=51728
LEP-SLC	06	PRPL 427 257	ALEPH, DELPHI, L3, OPAL, SLD and working groups		REFID=51219;ERROR=1;ERROR=2
SCHAEL	06B	EPJ C47 547	S. Schael *et al.*	(LEP Collabs.)	REFID=51390

ABBIENDI	05A	EPJ C40 317	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=50673
ABDALLAH	05D	EPJ C44 147	J. Abdallah *et al.*	(DELPHI Collab.)	REFID=50861
ACHARD	05	PL B609 35	P. Achard *et al.*	(L3 Collab.)	REFID=50476
ACOSTA	05Q	PR D72 072004	D. Acosta *et al.*	(CDF Collab.)	REFID=50890
PARK	05	PRL 94 021801	H.K. Park *et al.*	(FNAL HyperCP Collab.)	REFID=50480
ABBIENDI	04K	PL B597 11	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=49983
ABBIENDI	04M	EPJ C37 49	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=50150
ABDALLAH	04	EPJ C32 145	J. Abdallah *et al.*	(DELPHI Collab.)	REFID=49681
ABDALLAH	04B	EPJ C32 475	J. Abdallah *et al.*	(DELPHI Collab.)	REFID=49843
ABDALLAH	04L	EPJ C35 313	J. Abdallah *et al.*	(DELPHI Collab.)	REFID=49971
ABDALLAH	04O	EPJ C38 1	J. Abdallah *et al.*	(DELPHI Collab.)	REFID=50304
ACHARD	04B	PL B583 14	P. Achard *et al.*	(L3 Collab.)	REFID=49819
ACHARD	04F	PL B589 89	P. Achard *et al.*	(L3 Collab.)	REFID=49904
ABBIENDI	03F	EPJ C27 311	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=49375
ABBIENDI	03G	EPJ C27 483	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=49378
ACHARD	03C	PL B568 191	P. Achard *et al.*	(L3 Collab.)	REFID=49525
ABBIENDI	02D	EPJ C23 397	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=48741
ABBIENDI	02F	PL B544 44	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=48916
ACHARD	02C	PL B534 28	P. Achard *et al.*	(L3 Collab.)	REFID=48645
ACHARD	02H	PL B545 30	P. Achard *et al.*	(L3 Collab.)	REFID=48962
AKEROYD	02	PR D66 037702	A.G. Akeroyd *et al.*		REFID=48908
HEISTER	02	PL B526 191	A. Heister *et al.*	(ALEPH Collab.)	REFID=48539
HEISTER	02L	PL B544 16	A. Heister *et al.*	(ALEPH Collab.)	REFID=48913
HEISTER	02M	PL B544 25	A. Heister *et al.*	(ALEPH Collab.)	REFID=48914
ABBIENDI	01E	EPJ C18 425	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=48070
ABREU	01F	PL B507 89	P. Abreu *et al.*	(DELPHI Collab.)	REFID=48071
AFFOLDER	01H	PR D64 092002	T. Affolder *et al.*	(CDF Collab.)	REFID=48392
BARATE	01C	PL B499 53	R. Barate *et al.*	(ALEPH Collab.)	REFID=48046
ACCIARRI	00M	PL B485 85	M. Acciarri *et al.*	(L3 Collab.)	REFID=47719
ACCIARRI	00R	PL B489 102	M. Acciarri *et al.*	(L3 Collab.)	REFID=47759
ACCIARRI	00S	PL B489 115	M. Acciarri *et al.*	(L3 Collab.)	REFID=47760
BARATE	00L	PL B487 241	R. Barate *et al.*	(ALEPH Collab.)	REFID=47722
ABBIENDI	99E	EPJ C7 407	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=46641
ABBIENDI	99O	PL B464 311	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=47240
ABBOTT	99B	PRL 82 2244	B. Abbott *et al.*	(D0 Collab.)	REFID=46647
ABREU	99P	PL B458 431	P. Abreu *et al.*	(DELPHI Collab.)	REFID=47040
ABBOTT	98	PRL 80 442	B. Abbott *et al.*	(D0 Collab.)	REFID=45800
ACKERSTAFF	98S	EPJ C5 19	K. Ackerstaff *et al.*	(OPAL Collab.)	REFID=46153
ACKERSTAFF	98Y	PL B437 218	K. Ackerstaff *et al.*	(OPAL Collab.)	REFID=46254
GONZALEZ...	98B	PR D57 7045	M.C. Gonzalez-Garcia, S.M. Lietti, S.F. Novaes		REFID=46198
KRAWCZYK	97	PR D55 6968	M. Krawczyk, J. Zochowski	(WARS)	REFID=45466
ALEXANDER	96H	ZPHY C71 1	G. Alexander *et al.*	(OPAL Collab.)	REFID=44822
ABREU	95H	ZPHY C67 69	P. Abreu *et al.*	(DELPHI Collab.)	REFID=44368
BALEST	95	PR D51 2053	R. Balest *et al.*	(CLEO Collab.)	REFID=44146
PICH	92	NP B388 31	A. Pich, J. Prades, P. Yepes	(CERN, CPPM)	REFID=43104
ANTREASYAN	90C	PL B251 204	D. Antreasyan *et al.*	(Crystal Ball Collab.)	REFID=41455