$h_c(1P)$

$I^G(J^{PC}) = 0^-(1^{+-})$

Quantum numbers are quark model prediction, $C = -$ established by $\eta_c\gamma$ decay.

$h_c(1P)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
3525.37±0.14 OUR AVERAGE		Error includes scale factor of 1.2.			
3525.32±0.06±0.15	23k	ABLIKIM	22AQ	BES3	$\psi(2S) \to \pi^0$ hadrons; $\pi^0\gamma(\eta_c)$
3525.20±0.18±0.12	1282	[1] DOBBS	08A	CLEO	$\psi(2S) \to \pi^0\eta_c\gamma$
3525.8 ±0.2 ±0.2	13	ANDREOTTI	05B	E835	$\overline{p}p \to \eta_c\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
3525.31±0.11±0.14	832	[2,3] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma$ hadrons
3525.40±0.13±0.18	3679	[2] ABLIKIM	10B	BES3	$\psi(2S) \to \pi^0\gamma\eta_c$
3525.6 ±0.5	92	ADAMS	09	CLEO	$\psi(2S) \to 2(\pi^+\pi^-\pi^0)$
3524.4 ±0.6 ±0.4	168	[4] ROSNER	05	CLEO	$\psi(2S) \to \pi^0\eta_c\gamma$
3527 ±8	42	ANTONIAZZI	94	E705	300 $\pi^\pm$, pLi $\to J/\psi\pi^0$X
3526.28±0.18±0.19	59	[5] ARMSTRONG	92D	E760	$\overline{p}p \to J/\psi\pi^0$
3525.4 ±0.8 ±0.4	5	BAGLIN	86	SPEC	$\overline{p}p \to J/\psi$X

[1] Combination of exclusive and inclusive analyses for the reaction $\psi(2S) \to \pi^0 h_c \to \pi^0\eta_c\gamma$. This result is the average of DOBBS 08A and ROSNER 05.
[2] Superseded by ABLIKIM 22AQ
[3] With floating width.
[4] Superseded by DOBBS 08A.
[5] Mass central value and systematic error recalculated by us according to Eq. (16) in ARMSTRONG 93B, using the value for the $\psi(2S)$ mass from AULCHENKO 03.

$h_c(1P)$ WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.78^{+0.27}_{-0.24}\pm0.12}$		23k	ABLIKIM	22AQ	BES3	$\psi(2S) \to \pi^0$ hadrons; $\pi^0\gamma(\eta_c)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.70±0.28±0.22		832	[1,2] ABLIKIM	12N	BES3	$\psi(2S) \to \pi^0\gamma$ hadrons
< 1.44	90	3679	[3] ABLIKIM	10B	BES3	$\psi(2S) \to \pi^0\gamma\eta_c$
< 1		13	ANDREOTTI	05B	E835	$\overline{p}p \to \eta_c\gamma$
< 1.1	90	59	ARMSTRONG	92D	E760	$\overline{p}p \to J/\psi\pi^0$

[1] Superseded by ABLIKIM 22AQ
[2] With floating mass.
[3] The central value is $\Gamma = 0.73 \pm 0.45 \pm 0.28$ MeV.

$h_c(1P)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1	$J/\psi(1S)\pi^0$	$< 5 \times 10^{-4}$	90%
Γ_2	$J/\psi(1S)\pi\pi$	not seen	
Γ_3	$J/\psi(1S)\pi^+\pi^-$	$< 2.7 \times 10^{-3}$	90%
Γ_4	$p\overline{p}$	$< 1.7 \times 10^{-4}$	90%
Γ_5	$p\overline{p}\pi^0$	$< 8 \times 10^{-4}$	90%
Γ_6	$p\overline{p}\pi^+\pi^-$	$(3.3\pm0.6) \times 10^{-3}$	
Γ_7	$p\overline{p}\pi^0\pi^0$	$< 6 \times 10^{-4}$	90%
Γ_8	$p\overline{p}\pi^+\pi^-\pi^0$	$(4.4\pm1.3) \times 10^{-3}$	
Γ_9	$p\overline{p}\eta$	$(7.4\pm2.2) \times 10^{-4}$	
Γ_{10}	$\pi^+\pi^-\pi^0$	$(1.9\pm0.5) \times 10^{-3}$	
Γ_{11}	$\pi^+\pi^-\pi^0\eta$	$(8.3\pm2.4) \times 10^{-3}$	
Γ_{12}	$2\pi^+2\pi^-\pi^0$	$(9.4\pm1.7) \times 10^{-3}$	
Γ_{13}	$3\pi^+3\pi^-\pi^0$	< 1.0 %	90%
Γ_{14}	$K^+K^-\pi^+\pi^-$	$< 7 \times 10^{-4}$	90%
Γ_{15}	$K^+K^-\pi^+\pi^-\pi^0$	$(3.8\pm0.8) \times 10^{-3}$	
Γ_{16}	$K^+K^-\pi^+\pi^-\eta$	$< 2.7 \times 10^{-3}$	90%
Γ_{17}	$K^+K^-\pi^0$	$< 6 \times 10^{-4}$	90%
Γ_{18}	$K^+K^-\pi^0\eta$	$< 2.4 \times 10^{-3}$	90%
Γ_{19}	$K^+K^-\eta$	$< 1.0 \times 10^{-3}$	90%
Γ_{20}	$2K^+2K^-\pi^0$	$< 2.8 \times 10^{-4}$	90%
Γ_{21}	$K^0_S K^\pm\pi^\mp$	$< 6 \times 10^{-4}$	90%
Γ_{22}	$K^0_S K^\pm\pi^\mp\pi^+\pi^-$	$(3.2\pm1.0) \times 10^{-3}$	
	Radiative decays		
Γ_{23}	$\gamma\eta$	$(4.7\pm2.1) \times 10^{-4}$	
Γ_{24}	$\gamma\eta'(958)$	$(1.5\pm0.4) \times 10^{-3}$	
Γ_{25}	$\gamma\eta_c(1S)$	(60 ± 4) %	

FIT INFORMATION

A multiparticle fit to $\eta_c(1S)$, $J/\psi(1S)$, $\psi(2S)$, $h_c(1P)$, and $B^\pm$ with the total width, 10 combinations of partial widths obtained from integrated cross section, and 38 branching ratios uses 113 measurements to determine 19 parameters. The overall fit has a $\chi^2 = 184.6$ for 94 degrees of freedom.

$h_c(1P)$ PARTIAL WIDTHS

$h_c(1P)$ $\Gamma(i)\Gamma(\overline{p}p)/\Gamma(\text{total})$

$\Gamma(\gamma\eta_c(1S)) \times \Gamma(p\overline{p})/\Gamma_{\text{total}}$ — $\Gamma_{25}\Gamma_4/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
12.0±4.5	13	[1] ANDREOTTI	05B	E835	$\overline{p}p \to \eta_c\gamma$

[1] Assuming $\Gamma = 1$ MeV.

$h_c(1P)$ BRANCHING RATIOS

$\Gamma(J/\psi(1S)\pi^0)/\Gamma(\gamma\eta_c(1S))$ — Γ_1/Γ_{25}

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<9 × 10^{-4}	90	[1] ABLIKIM	22N	BES3	$e^+e^- \to \pi^+\pi^- h_c$

[1] ABLIKIM 22N reports $[\Gamma(h_c(1P) \to J/\psi(1S)\pi^0)/\Gamma(h_c(1P) \to \gamma\eta_c(1S))]$ / $[B(\eta_c \to K^+K^-\pi^0)] < 7.5 \times 10^{-2}$ which we multiply by our best value $B(\eta_c \to K^+K^-\pi^0) = 1/6\ B(\eta_c(1S) \to K\overline{K}\pi) = 1/6\ (7.1 \times 10^{-2})$.

$\Gamma(J/\psi(1S)\pi\pi)/\Gamma(J/\psi(1S)\pi^0)$ — Γ_2/Γ_1

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.18	90	ARMSTRONG	92D	E760	$\overline{p}p \to J/\psi\pi^0$

$\Gamma(J/\psi(1S)\pi^+\pi^-)/\Gamma_{\text{total}}$ — Γ_3/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<2.7 × 10^{-3}	90	[1] ABLIKIM	18M	BES3	$\psi(2S) \to \pi^0\pi^+\pi^- J/\psi$

[1] ABLIKIM 18M reports $[\Gamma(h_c(1P) \to J/\psi(1S)\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] < 2.0 \times 10^{-6}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = 7.4 \times 10^{-4}$.

$\Gamma(p\overline{p})/\Gamma_{\text{total}}$ — Γ_4/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.7 × 10^{-4}	90	[1] ABLIKIM	13V	BES3	$\psi(2S) \to \gamma p\overline{p}$

[1] ABLIKIM 13V reports $[\Gamma(h_c(1P) \to p\overline{p})/\Gamma_{\text{total}}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] < 1.3 \times 10^{-7}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = 7.4 \times 10^{-4}$.

$\Gamma(p\overline{p}\pi^0)/\Gamma_{\text{total}}$ — Γ_5/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<8 × 10^{-4}	90	[1] ABLIKIM	22M	BES3	$\psi(2S) \to \pi^0 h_c(1P)$

[1] ABLIKIM 22M reports $[\Gamma(h_c(1P) \to p\overline{p}\pi^0)/\Gamma_{\text{total}}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] < 5.67 \times 10^{-7}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = 7.4 \times 10^{-4}$.

$\Gamma(p\overline{p}\pi^+\pi^-)/\Gamma_{\text{total}}$ — Γ_6/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
3.3±0.5±0.2	230	[1] ABLIKIM	19AG	BES3	$\psi(2S) \to \pi^0 h_c(1P)$

[1] ABLIKIM 19AG reports $[\Gamma(h_c(1P) \to p\overline{p}\pi^+\pi^-)/\Gamma_{\text{total}}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] = (2.49 \pm 0.27 \pm 0.28) \times 10^{-6}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\overline{p}\pi^0\pi^0)/\Gamma_{total}$ — Γ_7/Γ

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<6 × 10^{-4}	90	12	[1] ABLIKIM	20AH	BES3	$\psi(2S) \to \pi^0 h_c(1P)$

[1] ABLIKIM 20AH reports $[\Gamma(h_c(1P) \to p\overline{p}\pi^0\pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] < 4.4 \times 10^{-7}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = 7.4 \times 10^{-4}$.

$\Gamma(p\overline{p}\pi^+\pi^-\pi^0)/\Gamma_{total}$ — Γ_8/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
4.4±1.2±0.3	86	[1] ABLIKIM	22M	BES3	$\psi(2S) \to \pi^0 h_c(1P)$

[1] ABLIKIM 22M reports $[\Gamma(h_c(1P) \to p\overline{p}\pi^+\pi^-\pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] = (3.30 \pm 0.71 \pm 0.59) \times 10^{-6}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(p\overline{p}\eta)/\Gamma_{total}$ — Γ_9/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
7.4±2.1±0.5	20	[1] ABLIKIM	22M	BES3	$\psi(2S) \to \pi^0 h_c(1P)$

[1] ABLIKIM 22M reports $[\Gamma(h_c(1P) \to p\overline{p}\eta)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] = (5.51 \pm 1.50 \pm 0.46) \times 10^{-7}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{total}$ — Γ_{10}/Γ

VALUE (units 10^{-3})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
1.9±0.5±0.1		101	[1] ABLIKIM	19AG	BES3	$\psi(2S) \to \pi^0 h_c(1P)$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<2.6	90		[2] ADAMS	09	CLEO	$\psi(2S) \to \pi^0 \gamma \eta_c$

[1] ABLIKIM 19AG reports $[\Gamma(h_c(1P) \to \pi^+\pi^-\pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] = (1.38 \pm 0.35 \pm 0.17) \times 10^{-6}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] ADAMS 09 reports $[\Gamma(h_c(1P) \to \pi^+\pi^-\pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] < 0.19 \times 10^{-5}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = 7.4 \times 10^{-4}$.

$\Gamma(\pi^+\pi^-\pi^0\eta)/\Gamma_{total}$ — Γ_{11}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
8.3±2.3±0.6	35	[1] ABLIKIM	20AH	BES3	$\psi(2S) \to \pi^0 h_c(1P)$

[1] ABLIKIM 20AH reports $[\Gamma(h_c(1P) \to \pi^+\pi^-\pi^0\eta)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] = (6.2 \pm 1.6 \pm 0.7) \times 10^{-6}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(2\pi^+ 2\pi^- \pi^0)/\Gamma_{total}$ Γ_{12}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
0.94±0.17 OUR AVERAGE					
0.86±0.16±0.06	254	[1] ABLIKIM	19AG	BES3	$\psi(2S) \to \pi^0 h_c(1P)$
$2.5\ ^{+0.9}_{-0.7}\ \pm0.2$	92	[2] ADAMS	09	CLEO	$\psi(2S) \to \pi^0 \gamma \eta_c$

[1] ABLIKIM 19AG reports $[\Gamma(h_c(1P) \to 2\pi^+ 2\pi^- \pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] = (6.40 \pm 0.81 \pm 0.87) \times 10^{-6}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] ADAMS 09 reports $[\Gamma(h_c(1P) \to 2\pi^+ 2\pi^- \pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] = (1.88^{+0.48}_{-0.45}{}^{+0.47}_{-0.30}) \times 10^{-5}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(3\pi^+ 3\pi^- \pi^0)/\Gamma_{total}$ Γ_{13}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.010	90	[1] ABLIKIM	19AG	BES3	$\psi(2S) \to \pi^0 h_c(1P)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.034	90	[2] ADAMS	09	CLEO	$\psi(2S) \to \pi^0 \gamma \eta_c$

[1] ABLIKIM 19AG reports $[\Gamma(h_c(1P) \to 3\pi^+ 3\pi^- \pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] < 7.5 \times 10^{-6}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = 7.4 \times 10^{-4}$.

[2] ADAMS 09 reports $[\Gamma(h_c(1P) \to 3\pi^+ 3\pi^- \pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] < 2.5 \times 10^{-5}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = 7.4 \times 10^{-4}$.

$\Gamma(K^+ K^- \pi^+ \pi^-)/\Gamma_{total}$ Γ_{14}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<7 × 10^−4	90	[1] ABLIKIM	19AG	BES3	$\psi(2S) \to \pi^0 h_c(1P)$

[1] ABLIKIM 19AG reports $[\Gamma(h_c(1P) \to K^+ K^- \pi^+ \pi^-)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] < 0.5 \times 10^{-6}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = 7.4 \times 10^{-4}$.

$\Gamma(K^+ K^- \pi^+ \pi^- \pi^0)/\Gamma_{total}$ Γ_{15}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
3.8±0.8±0.3	80	[1] ABLIKIM	20AH	BES3	$\psi(2S) \to \pi^0 h_c(1P)$

[1] ABLIKIM 20AH reports $[\Gamma(h_c(1P) \to K^+ K^- \pi^+ \pi^- \pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] = (2.8 \pm 0.5 \pm 0.3) \times 10^{-6}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(K^+ K^- \pi^+ \pi^- \eta)/\Gamma_{total}$ Γ_{16}/Γ

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<2.7 × 10^−3	90	24	[1] ABLIKIM	20AH	BES3	$\psi(2S) \to \pi^0 h_c(1P)$

[1] ABLIKIM 20AH reports $[\Gamma(h_c(1P) \to K^+ K^- \pi^+ \pi^- \eta)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] < 2.0 \times 10^{-6}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = 7.4 \times 10^{-4}$.

$\Gamma(K^+K^-\pi^0)/\Gamma_{total}$ — Γ_{17}/Γ

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<6 \times 10^{-4}$	90	20	[1] ABLIKIM	20AH	BES3	$\psi(2S) \to \pi^0 h_c(1P)$

[1] ABLIKIM 20AH reports $[\Gamma(h_c(1P) \to K^+K^-\pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] < 4.8 \times 10^{-7}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = 7.4 \times 10^{-4}$.

$\Gamma(K^+K^-\pi^0\eta)/\Gamma_{total}$ — Γ_{18}/Γ

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<2.4 \times 10^{-3}$	90	20	[1] ABLIKIM	20AH	BES3	$\psi(2S) \to \pi^0 h_c(1P)$

[1] ABLIKIM 20AH reports $[\Gamma(h_c(1P) \to K^+K^-\pi^0\eta)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] < 1.8 \times 10^{-6}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = 7.4 \times 10^{-4}$.

$\Gamma(K^+K^-\eta)/\Gamma_{total}$ — Γ_{19}/Γ

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<1.0 \times 10^{-3}$	90	18	[1] ABLIKIM	20AH	BES3	$\psi(2S) \to \pi^0 h_c(1P)$

[1] ABLIKIM 20AH reports $[\Gamma(h_c(1P) \to K^+K^-\eta)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] < 7.5 \times 10^{-7}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = 7.4 \times 10^{-4}$.

$\Gamma(2K^+2K^-\pi^0)/\Gamma_{total}$ — Γ_{20}/Γ

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<2.8 \times 10^{-4}$	90	11	[1] ABLIKIM	20AH	BES3	$\psi(2S) \to \pi^0 h_c(1P)$

[1] ABLIKIM 20AH reports $[\Gamma(h_c(1P) \to 2K^+2K^-\pi^0)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] < 2.1 \times 10^{-7}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = 7.4 \times 10^{-4}$.

$\Gamma(K^0_S K^\pm\pi^\mp)/\Gamma_{total}$ — Γ_{21}/Γ

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
$<6 \times 10^{-4}$	90	17	[1] ABLIKIM	20AH	BES3	$\psi(2S) \to \pi^0 h_c(1P)$

[1] ABLIKIM 20AH reports $[\Gamma(h_c(1P) \to K^0_S K^\pm\pi^\mp)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] < 4.8 \times 10^{-7}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = 7.4 \times 10^{-4}$.

$\Gamma(K^0_S K^\pm\pi^\mp\pi^+\pi^-)/\Gamma_{total}$ — Γ_{22}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
$3.2 \pm 1.0 \pm 0.2$	41	[1] ABLIKIM	20AH	BES3	$\psi(2S) \to \pi^0 h_c(1P)$

[1] ABLIKIM 20AH reports $[\Gamma(h_c(1P) \to K^0_S K^\pm\pi^\mp\pi^+\pi^-)/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] = (2.4 \pm 0.7 \pm 0.3) \times 10^{-6}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

RADIATIVE DECAYS

$\Gamma(\gamma\eta)/\Gamma_{total}$ — Γ_{23}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
$4.7 \pm 1.5 \pm 1.4$	18	ABLIKIM	16I	BES3	$\psi(2S) \to \pi^0\gamma\eta$

$\Gamma(\gamma\eta'(958))/\Gamma_{total}$ Γ_{24}/Γ

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
1.52±0.27±0.29	44	ABLIKIM	16I	BES3	$\psi(2S) \to \pi^0\gamma\eta'(958)$

$\Gamma(\gamma\eta_c(1S))/\Gamma_{total}$ Γ_{25}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
60± 4 OUR FIT					
57± 5 OUR AVERAGE					
57± 4±4	23k	[1] ABLIKIM	22AQ	BES3	$\psi(2S) \to \pi^0$ hadrons; $\pi^0\gamma(\eta_c)$
56± 6±4		[2] DOBBS	08A	CLEO	$\psi(2S) \to \pi^0\eta_c\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
62± 9±4	3679	[3,4] ABLIKIM	10B	BES3	$\psi(2S) \to \pi^0\eta_c\gamma$
56± 7±4	1282	[5] DOBBS	08A	CLEO	$\psi(2S) \to \pi^0\eta_c\gamma$
54±14±4	168	[6] ROSNER	05	CLEO	$\psi(2S) \to \pi^0\eta_c\gamma$

[1] ABLIKIM 22AQ reports $[\Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] = (4.22^{+0.27}_{-0.26} \pm 0.19) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] Average of DOBBS 08A and ROSNER 05. DOBBS 08A reports $[\Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] = (4.16 \pm 0.30 \pm 0.37) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[3] ABLIKIM 10B reports $[\Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] = (4.58 \pm 0.40 \pm 0.50) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[4] Superseded by ABLIKIM 22AQ

[5] DOBBS 08A reports $[\Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] = (4.19 \pm 0.32 \pm 0.45) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[6] ROSNER 05 reports $[\Gamma(h_c(1P) \to \gamma\eta_c(1S))/\Gamma_{total}] \times [B(\psi(2S) \to h_c(1P)\pi^0)] = (4.0 \pm 0.8 \pm 0.7) \times 10^{-4}$ which we divide by our best value $B(\psi(2S) \to h_c(1P)\pi^0) = (7.4 \pm 0.5) \times 10^{-4}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$h_c(1P)$ REFERENCES

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