

X(4260)

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

Seen in radiative return from e^+e^- collisions at $\sqrt{s} = 9.54\text{--}10.58$ GeV by AUBERT,B 05I, HE 06B, and YUAN 07, and in e^+e^- collisions at $\sqrt{s} \approx 4.26$ GeV by COAN 06. Possibly seen by AUBERT 06 in $B^- \rightarrow K^- \pi^+ \pi^- J/\psi$. See also the mini-review under the X(3872). (See the index for the page number.)

X(4260) MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
4263⁺⁸₋₉ OUR AVERAGE Error includes scale factor of 1.1.				
4247 ± 12 ⁺¹⁷ ₋₃₂		¹ YUAN	07 BELL	10.58 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$
4284 ⁺¹⁷ ₋₁₆ ± 4	13.6	HE	06B CLEO	9.4–10.6 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$
4259 ± 8 ⁺² ₋₆	125	² AUBERT,B	05I BABR	10.58 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$

¹ From a two-resonance fit.

² From a single-resonance fit. Two interfering resonances are not excluded.

X(4260) WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
95 ± 14 OUR AVERAGE				
108 ± 19 ± 10		³ YUAN	07 BELL	10.58 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$
73 ⁺³⁹ ₋₂₅ ± 5	13.6	HE	06B CLEO	9.4–10.6 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$
88 ± 23 ⁺⁶ ₋₄	125	⁴ AUBERT,B	05I BABR	10.58 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$

³ From a two-resonance fit.

⁴ From a single-resonance fit. Two interfering resonances are not excluded.

X(4260) DECAY MODES

Mode	Fraction (Γ_i/Γ)
Γ_1 e^+e^-	
Γ_2 $J/\psi\pi^+\pi^-$	seen
Γ_3 $J/\psi\pi^0\pi^0$	[a] seen
Γ_4 $J/\psi K^+K^-$	[a] seen
Γ_5 $J/\psi\eta$	[a] not seen
Γ_6 $J/\psi\pi^0$	[a] not seen
Γ_7 $J/\psi\eta'$	[a] not seen
Γ_8 $J/\psi\pi^+\pi^-\pi^0$	[a] not seen
Γ_9 $J/\psi\eta\eta$	[a] not seen
Γ_{10} $\psi(2S)\pi^+\pi^-$	[a] not seen
Γ_{11} $\psi(2S)\eta$	[a] not seen

Γ_{12}	$\chi_{c0}\omega$	[a] not seen
Γ_{13}	$\chi_{c1}\gamma$	[a] not seen
Γ_{14}	$\chi_{c2}\gamma$	[a] not seen
Γ_{15}	$\chi_{c1}\pi^+\pi^-\pi^0$	[a] not seen
Γ_{16}	$\chi_{c2}\pi^+\pi^-\pi^0$	[a] not seen
Γ_{17}	$\phi\pi^+\pi^-$	[a] not seen
Γ_{18}	$\phi f_0(980) \rightarrow \phi\pi^+\pi^-$	not seen
Γ_{19}	$D\bar{D}$	not seen
Γ_{20}	$D^0 D^{*-}\pi^+$	not seen
Γ_{21}	$D^*\bar{D}$	not seen
Γ_{22}	$D^*\bar{D}^*$	not seen
Γ_{23}	$D^*\bar{D}\pi$	not seen
Γ_{24}	$D^*\bar{D}^*\pi$	not seen
Γ_{25}	$D_s^+ D_s^-$	not seen
Γ_{26}	$D_s^{*+} D_s^-$	not seen
Γ_{27}	$D_s^{*+} D_s^{*-}$	not seen
Γ_{28}	$p\bar{p}$	not seen
Γ_{29}	$K_S^0 K^\pm \pi^\mp$	not seen
Γ_{30}	$K^+ K^- \pi^0$	not seen

[a] See COAN 06 for details.

$X(4260) \Gamma(i)\Gamma(e^+e^-)/\Gamma(\text{total})$

$\Gamma(J/\psi\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_2\Gamma_1/\Gamma$
VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT	

$5.9^{+1.2}_{-0.9}$ OUR AVERAGE

$6.0 \pm 1.2^{+4.7}_{-0.5}$		⁵ YUAN	07	BELL	10.58 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$
$8.9^{+3.9}_{-3.1} \pm 1.8$	8.1	HE	06B	CLEO	9.4–10.6 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$
$5.5 \pm 1.0^{+0.8}_{-0.7}$	125	⁶ AUBERT,B	05I	BABR	10.58 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$

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

$20.6 \pm 2.3^{+9.1}_{-1.7}$		⁷ YUAN	07	BELL	10.58 $e^+e^- \rightarrow \gamma\pi^+\pi^- J/\psi$
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⁵ Solution I of two equivalent solutions in a fit using two interfering resonances.

⁶ From a single-resonance fit. Two interfering resonances are not excluded.

⁷ Solution II of two equivalent solutions in a fit using two interfering resonances.

$\Gamma(J/\psi K^+K^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$					$\Gamma_4\Gamma_1/\Gamma$
VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT	

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

<1.2	90	⁸ YUAN	08	BELL	$e^+e^- \rightarrow \gamma K^+K^- J/\psi$
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⁸ From a fit of the broad $K^+K^- J/\psi$ enhancement including a coherent $X(4260)$ amplitude with mass and width from YUAN 07.

$\Gamma(\psi(2S)\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{10}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<4.3	90	⁹ LIU	08H RVUE	10.58 $e^+e^- \rightarrow \psi(2S)\pi^+\pi^-\gamma$
$7.4^{+2.1}_{-1.7}$		¹⁰ LIU	08H RVUE	10.58 $e^+e^- \rightarrow \psi(2S)\pi^+\pi^-\gamma$

⁹ For constructive interference with the X(4360) in a combined fit of AUBERT 07S and WANG 07D data with three resonances.

¹⁰ For destructive interference with the X(4360) in a combined fit of AUBERT 07S and WANG 07D data with three resonances.

$\Gamma(\phi\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{17}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
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<0.4	90	AUBERT, BE	06D BABR	10.6 $e^+e^- \rightarrow K^+K^-\pi^+\pi^-\gamma$
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$\Gamma(\phi f_0(980) \rightarrow \phi\pi^+\pi^-) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{18}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
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<0.29	90	¹¹ AUBERT	07AK BABR	10.6 $e^+e^- \rightarrow \pi^+\pi^-K^+K^-\gamma$
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¹¹ AUBERT 07AK reports $[\Gamma(X(4260) \rightarrow \phi f_0(980) \rightarrow \phi\pi^+\pi^-) \times \Gamma(X(4260) \rightarrow e^+e^-)/\Gamma_{\text{total}}] \times [B(\phi(1020) \rightarrow K^+K^-)] < 0.14$ eV which we divide by our best value $B(\phi(1020) \rightarrow K^+K^-) = 48.9 \times 10^{-2}$.

$\Gamma(K_S^0 K^\pm \pi^\mp) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{29}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.5	90	AUBERT	08S BABR	10.6 $e^+e^- \rightarrow K_S^0 K^\pm \pi^\mp \gamma$
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$\Gamma(K^+K^-\pi^0) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{30}\Gamma_1/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.6	90	AUBERT	08S BABR	10.6 $e^+e^- \rightarrow K^+K^-\pi^0\gamma$
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X(4260) BRANCHING RATIOS

$\Gamma(D\bar{D})/\Gamma(J/\psi\pi^+\pi^-)$ Γ_{19}/Γ_2

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<1.0	90	¹² AUBERT	07BE BABR	$e^+e^- \rightarrow D\bar{D}\gamma$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

<4.0	90	CRONIN-HEN..09	CLEO	e^+e^-
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¹² Using 4259 ± 10 MeV for the mass and 88 ± 24 MeV for the width of X(4260).

$\Gamma(D^0 D^{*-} \pi^+)/\Gamma(J/\psi\pi^+\pi^-)$ Γ_{20}/Γ_2

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<9	90	PAKHLOVA	09 BELL	$e^+e^- \rightarrow X(4260) \rightarrow D^0 D^{*-} \pi^+$
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$\Gamma(D^0 D^{*-} \pi^+)/\Gamma_{\text{total}} \times \Gamma(e^+ e^-)/\Gamma_{\text{total}}$					$\Gamma_{20}/\Gamma \times \Gamma_1/\Gamma$
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.42 × 10⁻⁶	90	¹³ PAKHLOVA 09	BELL	$e^+ e^- \rightarrow X(4260) \rightarrow D^0 D^{*-} \pi^+$	

¹³ Using 4263^{+8}_{-9} MeV for the mass of X(4260).

$\Gamma(D^* \bar{D})/\Gamma(J/\psi \pi^+ \pi^-)$					Γ_{21}/Γ_2
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<34	90	AUBERT 09M	BABR	$e^+ e^- \rightarrow \gamma D^* \bar{D}$	
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
<45	90	CRONIN-HEN..09	CLEO	$e^+ e^-$	

$\Gamma(D^* \bar{D}^*)/\Gamma(J/\psi \pi^+ \pi^-)$					Γ_{22}/Γ_2
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<11	90	CRONIN-HEN..09	CLEO	$e^+ e^-$	
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
<40	90	AUBERT 09M	BABR	$e^+ e^- \rightarrow \gamma D^* \bar{D}^*$	

$\Gamma(D^* \bar{D} \pi)/\Gamma(J/\psi \pi^+ \pi^-)$					Γ_{23}/Γ_2
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<15	90	CRONIN-HEN..09	CLEO	$e^+ e^-$	

$\Gamma(D^* \bar{D}^* \pi)/\Gamma(J/\psi \pi^+ \pi^-)$					Γ_{24}/Γ_2
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<8.2	90	CRONIN-HEN..09	CLEO	$e^+ e^-$	

$\Gamma(D_s^+ D_s^-)/\Gamma(J/\psi \pi^+ \pi^-)$					Γ_{25}/Γ_2
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<1.3	90	CRONIN-HEN..09	CLEO	$e^+ e^-$	

$\Gamma(D_s^{*+} D_s^-)/\Gamma(J/\psi \pi^+ \pi^-)$					Γ_{26}/Γ_2
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.8	90	CRONIN-HEN..09	CLEO	$e^+ e^-$	

$\Gamma(D_s^{*+} D_s^{*-})/\Gamma(J/\psi \pi^+ \pi^-)$					Γ_{27}/Γ_2
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<9.5	90	CRONIN-HEN..09	CLEO	$e^+ e^-$	

$\Gamma(p\bar{p})/\Gamma(J/\psi \pi^+ \pi^-)$					Γ_{28}/Γ_2
VALUE	CL%	DOCUMENT ID	COMMENT		
<0.13	90	¹⁴ AUBERT 06B	$e^+ e^- \rightarrow p\bar{p}\gamma$		

¹⁴ Using 4259 ± 10 MeV for the mass and 88 ± 24 MeV for the width of X(4260).

X(4260) REFERENCES

AUBERT	09M	PR D79 092001	B. Aubert <i>et al.</i>	(BABAR Collab.)
CRONIN-HEN...	09	PR D80 072001	D. Cronin-Hennessy <i>et al.</i>	(CLEO Collab.)
PAKHLOVA	09	PR D80 091101R	G. Pakhlova <i>et al.</i>	(BELLE Collab.)
AUBERT	08S	PR D77 092002	B. Aubert <i>et al.</i>	(BABAR Collab.)
LIU	08H	PR D78 014032	Z.Q. Liu, X.S. Qin, C.Z. Yuan	
YUAN	08	PR D77 011105R	C.Z. Yuan <i>et al.</i>	(BELLE Collab.)
AUBERT	07AK	PR D76 012008	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	07BE	PR D76 111105R	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	07S	PRL 98 212001	B. Aubert <i>et al.</i>	(BABAR Collab.)
WANG	07D	PRL 99 142002	X.L. Wang <i>et al.</i>	(BELLE Collab.)
YUAN	07	PRL 99 182004	C.Z. Yuan <i>et al.</i>	(BELLE Collab.)
AUBERT	06	PR D73 011101R	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	06B	PR D73 012005	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT,BE	06D	PR D74 091103R	B. Aubert <i>et al.</i>	(BABAR Collab.)
COAN	06	PRL 96 162003	T.E. Coan <i>et al.</i>	(CLEO Collab.)
HE	06B	PR D74 091104R	Q. He <i>et al.</i>	(CLEO Collab.)
AUBERT,B	05I	PRL 95 142001	B. Aubert <i>et al.</i>	(BABAR Collab.)
