

$D_{s1}(2460)^{\pm}$

$$I(J^P) = 0(1^+)^{\pm}$$

See the review on "Heavy Non- $q\bar{q}$ Mesons." **$D_{s1}(2460)^{\pm}$ MASS**

The fit includes $D^{\pm}$, D^0 , $D_s^{\pm}$, $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^*(2460)^0$, and $D_{s1}(2536)^{\pm}$ mass and mass difference measurements.

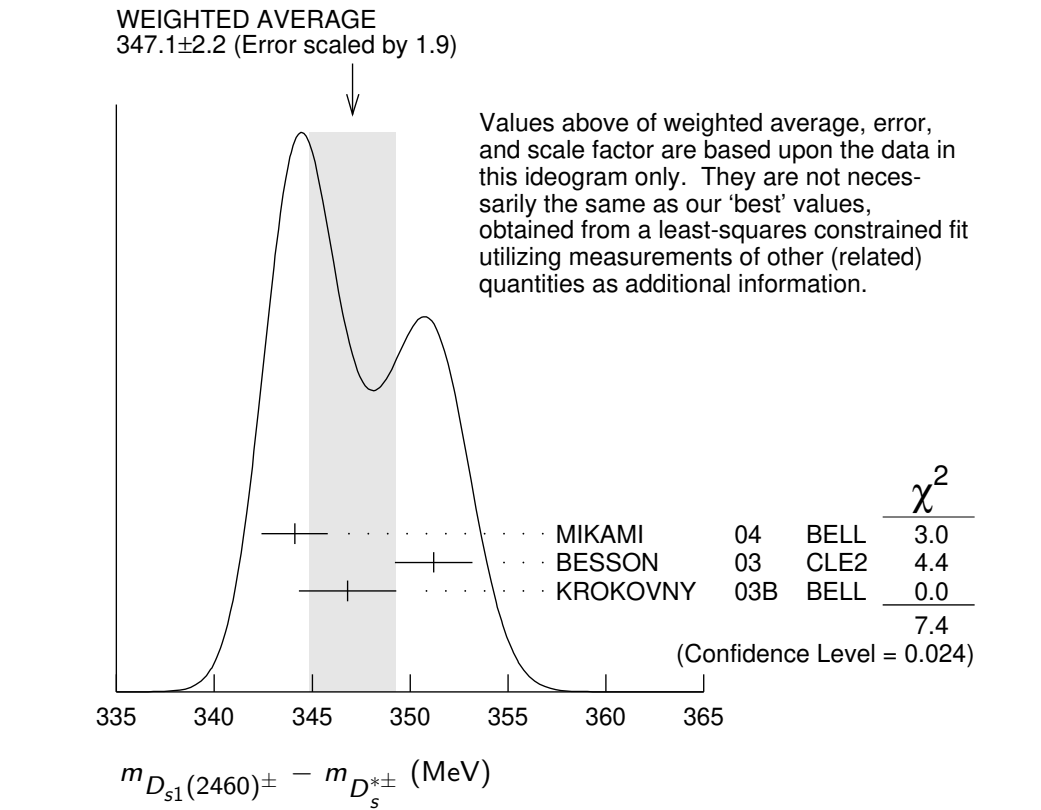
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2459.5$\pm$0.6 OUR FIT	Error includes scale factor of 1.1.			
2459.6$\pm$0.9 OUR AVERAGE	Error includes scale factor of 1.3.			
2460.1 $\pm$ 0.2 $\pm$ 0.8	¹	AUBERT	06P BABR	10.6 e^+e^-
2458.0 $\pm$ 1.0 $\pm$ 1.0	195	AUBERT	04E BABR	10.6 e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2459.5 $\pm$ 1.2 $\pm$ 3.7	920	AUBERT	06P BABR	10.6 $e^+e^- \rightarrow D_s^+ \gamma X$
2458.6 $\pm$ 1.0 $\pm$ 2.5	560	AUBERT	06P BABR	10.6 $e^+e^- \rightarrow D_s^+ \pi^0 \gamma X$
2460.2 $\pm$ 0.2 $\pm$ 0.8	123	AUBERT	06P BABR	10.6 $e^+e^- \rightarrow D_s^+ \pi^+ \pi^- X$
2458.9 $\pm$ 1.5	112	² AUBERT,B	04S BABR	$B \rightarrow D_{s1}(2460)^+ \bar{D}^{(*)}$
2461.1 $\pm$ 1.6	139	³ AUBERT,B	04S BABR	$B \rightarrow D_{s1}(2460)^+ \bar{D}^{(*)}$
2456.5 $\pm$ 1.3 $\pm$ 1.3	126	^{4,5} MIKAMI	04 BELL	10.6 e^+e^-
2459.5 $\pm$ 1.3 $\pm$ 2.0	152	^{6,7} MIKAMI	04 BELL	10.6 e^+e^-
2459.9 $\pm$ 0.9 $\pm$ 1.6	60	^{6,7} MIKAMI	04 BELL	10.6 e^+e^-
2459.2 $\pm$ 1.6 $\pm$ 2.0	57	KROKOVNY	03B BELL	10.6 e^+e^-
¹ The average of the values obtained from the $D_s^+ \gamma$, $D_s^+ \pi^0 \gamma$, $D_s^+ \pi^+ \pi^-$ final state.				
² Systematic errors not evaluated. From the decay to $D_s^{*+} \pi^0$.				
³ Systematic errors not evaluated. From the decay to $D_s^+ \gamma$.				
⁴ Not independent of the corresponding $m_{D_{s1}(2460)^{\pm}} - m_{D_s^{*\pm}}$.				
⁵ Using $m_{D_s^{*+}} = 2112.4 \pm 0.7$ MeV.				
⁶ Not independent of the corresponding $m_{D_{s1}(2460)^{\pm}} - m_{D_s^{\pm}}$.				
⁷ Using $m_{D_s^+} = 1968.5 \pm 0.6$ MeV.				

 $m_{D_{s1}(2460)^{\pm}} - m_{D_s^{*\pm}}$

The fit includes $D^{\pm}$, D^0 , $D_s^{\pm}$, $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^*(2460)^0$, and $D_{s1}(2536)^{\pm}$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
347.3$\pm$0.7 OUR FIT	Error includes scale factor of 1.2.			
347.1$\pm$2.2 OUR AVERAGE	Error includes scale factor of 1.9. See the ideogram below.			
344.1 $\pm$ 1.3 $\pm$ 1.1	126	MIKAMI	04 BELL	10.6 e^+e^-
351.2 $\pm$ 1.7 $\pm$ 1.0	41	BESSON	03 CLE2	10.6 e^+e^-
346.8 $\pm$ 1.6 $\pm$ 1.9	57	⁸ KROKOVNY	03B BELL	10.6 e^+e^-

⁸ Recalculated by us using $m_{D_s^{*+}} = 2112.4 \pm 0.7$ MeV.



$m_{D_{s1}(2460)^{\pm}} - m_{D_s^{\pm}}$

The fit includes $D^{\pm}$, D^0 , $D_s^{\pm}$, D_s^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^{*}(2460)^0$, and $D_{s1}(2536)^{\pm}$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
491.1±0.6 OUR FIT	Error includes scale factor of 1.1.			
491.3±1.4 OUR AVERAGE				
491.0±1.3±1.9	152	⁹ MIKAMI	04 BELL	10.6 e^+e^-
491.4±0.9±1.5	60	¹⁰ MIKAMI	04 BELL	10.6 e^+e^-

⁹ From the decay to $D_s^{\pm}\gamma$.
¹⁰ From the decay to $D_s^{\pm}\pi^+\pi^-$.

$D_{s1}(2460)^{\pm}$ WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
< 3.5	95	123	AUBERT	06P BABR	10.6 $e^+e^- \rightarrow D_s^+\pi^+\pi^-X$

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< 6.3	95	560	AUBERT	06P	BABR	10.6	$e^+e^- \rightarrow D_s^+\pi^0\gamma X$
<10		195	AUBERT	04E	BABR	10.6	e^+e^-
< 5.5	90	126	MIKAMI	04	BELL	10.6	e^+e^-
< 7	90	41	BESSION	03	CLE2	10.6	e^+e^-

$D_{s1}(2460)^+$ DECAY MODES

$D_{s1}(2460)^-$ modes are charge conjugates of the modes below.

Mode		Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1	$D_s^{*+}\pi^0$	(48 ±11) %	
Γ_2	$D_s^+\gamma$	(18 ± 4) %	
Γ_3	$D_s^+\pi^+\pi^-$	(4.3± 1.3) %	S=1.1
Γ_4	$D_s^{*+}\gamma$	< 8 %	CL=90%
Γ_5	$D_{s0}^*(2317)^+\gamma$	(3.7 ⁺ _{-2.4}) %	
Γ_6	$D_s^+\pi^0$		
Γ_7	$D_s^+\pi^0\pi^0$		
Γ_8	$D_s^+\gamma\gamma$		

CONSTRAINED FIT INFORMATION

An overall fit to 7 branching ratios uses 8 measurements and one constraint to determine 5 parameters. The overall fit has a $\chi^2 = 3.4$ for 4 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta x_i \delta x_j \rangle / (\delta x_i \cdot \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i/\Gamma_{\text{total}}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_2	80		
x_3	68	62	
x_5	-3	25	26
	x_1	x_2	x_3

$D_{s1}(2460)^\pm$ BRANCHING RATIOS

$\Gamma(D_s^{*+}\pi^0)/\Gamma_{\text{total}}$	Γ_1/Γ				
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.48±0.11 OUR FIT					
0.56±0.13±0.09	¹¹	AUBERT	06N	BABR	$B \rightarrow D_{s1}(2460)^- \overline{D}^{(*)}$

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

seen 41 BESSION 03 CLE2 10.6 e^+e^-

¹¹ Evaluated in AUBERT 06N including measurements from AUBERT,B 04s.

$\Gamma(D_s^+ \gamma)/\Gamma_{\text{total}}$	Γ_2/Γ		
VALUE	DOCUMENT ID	TECN	COMMENT
0.18±0.04 OUR FIT			
0.16±0.04±0.03	¹² AUBERT	06N BABR	$B \rightarrow D_{s1}(2460)^- \bar{D}^{(*)}$
¹² Evaluated in AUBERT 06N including measurements from AUBERT,B 04s.			

$\Gamma(D_s^+ \gamma)/\Gamma(D_s^{*+} \pi^0)$						Γ_2/Γ_1
VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	
0.38 ±0.05 OUR FIT						
0.44 ±0.09 OUR AVERAGE						
0.55 ±0.13 ±0.08		152	MIKAMI	04	BELL	10.6 $e^+ e^-$
0.38 ±0.11 ±0.04		38	KROKOVNY	03B	BELL	10.6 $e^+ e^-$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●						
0.274±0.045±0.020		251	¹³ AUBERT,B	04S	BABR	$B \rightarrow D_{s1}(2460)^+ \overline{D}^{(*)}$
< 0.49		90	BESSION	03	CLE2	10.6 $e^+ e^-$
¹³ Used by AUBERT 06N in their measurement of $B(D_s^{*-} \pi^0)$ and $B(D_s^- \gamma)$.						

$\Gamma(D_s^+ \pi^+ \pi^-)/\Gamma(D_s^{*+} \pi^0)$	Γ_3/Γ_1				
<u>VALUE</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.090±0.020 OUR FIT	Error includes scale factor of 1.2.				
0.14 ±0.04 ±0.02	60	MIKAMI	04	BELL	10.6 $e^+ e^-$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
<0.08	90	BESSION	03	CLE2	10.6 $e^+ e^-$

$\Gamma(D_s^{*+} \gamma)/\Gamma(D_s^{*+} \pi^0)$	Γ_4/Γ_1				
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.16	90	BESSION	03	CLE2	10.6 $e^+ e^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.31	90	MIKAMI	04	BELL	10.6 $e^+ e^-$

$\Gamma(D_{s0}^{*+}(2317)^+\gamma)/\Gamma(D_s^{*+}\pi^0)$					Γ_5/Γ_1
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.22	95	AUBERT	04E	BABR	10.6 e ⁺ e ⁻
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
<0.58	90	BESSION	03	CLE2	10.6 e ⁺ e ⁻

$\Gamma(D_s^{*+} \pi^0)/[\Gamma(D_s^{*+} \pi^0) + \Gamma(D_{s0}^{*+}(2317)^+ \gamma)]$	$\Gamma_1/(\Gamma_1+\Gamma_5)$		
VALUE	DOCUMENT ID	TECN	COMMENT
0.93±0.09 OUR FIT			
0.97±0.09±0.05	AUBERT	06P	BABR 10.6 $e^+ e^-$

$\Gamma(D_s^+ \gamma)/[\Gamma(D_s^{*+} \pi^0) + \Gamma(D_{s0}^{*+}(2317)^+ \gamma)]$	$\Gamma_2/(\Gamma_1+\Gamma_5)$		
VALUE	DOCUMENT ID	TECN	COMMENT
0.35 ±0.04 OUR FIT			
0.337±0.036±0.038	AUBERT	06P	BABR 10.6 $e^+ e^-$

$\Gamma(D_s^+ \pi^+ \pi^-) / [\Gamma(D_s^{*+} \pi^0) + \Gamma(D_{s0}^*(2317)^+ \gamma)]$					$\Gamma_3 / (\Gamma_1 + \Gamma_5)$
VALUE		DOCUMENT ID	TECN	COMMENT	
0.083±0.017 OUR FIT Error includes scale factor of 1.2.					
0.077±0.013±0.008		AUBERT	06P	BABR	10.6 e ⁺ e ⁻
$\Gamma(D_s^{*+} \gamma) / [\Gamma(D_s^{*+} \pi^0) + \Gamma(D_{s0}^*(2317)^+ \gamma)]$					$\Gamma_4 / (\Gamma_1 + \Gamma_5)$
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.24	95	AUBERT	06P	BABR	10.6 e ⁺ e ⁻
$\Gamma(D_{s0}^*(2317)^+ \gamma) / [\Gamma(D_s^{*+} \pi^0) + \Gamma(D_{s0}^*(2317)^+ \gamma)]$					$\Gamma_5 / (\Gamma_1 + \Gamma_5)$
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.25	95	AUBERT	06P	BABR	10.6 e ⁺ e ⁻
$\Gamma(D_s^+ \pi^0) / [\Gamma(D_s^{*+} \pi^0) + \Gamma(D_{s0}^*(2317)^+ \gamma)]$					$\Gamma_6 / (\Gamma_1 + \Gamma_5)$
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.042	95	AUBERT	06P	BABR	10.6 e ⁺ e ⁻
$\Gamma(D_s^+ \pi^0 \pi^0) / [\Gamma(D_s^{*+} \pi^0) + \Gamma(D_{s0}^*(2317)^+ \gamma)]$					$\Gamma_7 / (\Gamma_1 + \Gamma_5)$
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.68	95	AUBERT	06P	BABR	10.6 e ⁺ e ⁻
$\Gamma(D_s^+ \gamma \gamma) / [\Gamma(D_s^{*+} \pi^0) + \Gamma(D_{s0}^*(2317)^+ \gamma)]$					$\Gamma_8 / (\Gamma_1 + \Gamma_5)$
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.33	95	AUBERT	06P	BABR	10.6 e ⁺ e ⁻

$D_{s1}(2460)^\pm$ REFERENCES

AUBERT	06N	PR D74 031103	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	06P	PR D74 032007	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT	04E	PR D69 031101	B. Aubert <i>et al.</i>	(BABAR Collab.)
AUBERT,B	04S	PRL 93 181801	B. Aubert <i>et al.</i>	(BABAR Collab.)
MIKAMI	04	PRL 92 012002	Y. Mikami <i>et al.</i>	(BELLE Collab.)
BESSION	03	PR D68 032002	D. Besson <i>et al.</i>	(CLEO Collab.)
KROKOVNY	03B	PRL 91 262002	P. Krokovny <i>et al.</i>	(BELLE Collab.)