$D_{s1}(2536)^{\pm}$

$I(J^P) = 0(1^+)$
J, P need confirmation.

Seen in $D^*(2010)^+ K^0$, $D^*(2007)^0 K^+$, and $D_s^+ \pi^+ \pi^-$. Not seen in $D^+ K^0$ or $D^0 K^+$. $J^P = 1^+$ assignment strongly favored.

$D_{s1}(2536)^{\pm}$ 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
2535.11±0.06 OUR FIT					
2535.21±0.28 OUR AVERAGE					
2537.7 ±0.5 ±3.1	24	[1] ABLIKIM	19P	BES3	4.6 $e^+ e^- \to D_s^+ \overline{D}^0 K^-$
2535.7 ±0.6 ±0.5	46	[2] ABAZOV	09G	D0	$B_s^0 \to D_{s1}^- \mu^+ \nu_\mu X$
2534.78±0.31±0.40	182	AUBERT	08B	BABR	$B \to \overline{D}^{(*)} D^* K$
2534.6 ±0.3 ±0.7	193	AUBERT	06P	BABR	10.6 $e^+ e^- \to D_s^+ \pi^+ \pi^- X$
2535.3 ±0.7	92	[3] HEISTER	02B	ALEP	$e^+ e^- \to D^{*+} K^0 X$, $D^{*0} K^+ X$
2534.2 ±1.2	9	ASRATYAN	94	BEBC	$\nu N \to D^* K^0 X, D^{*0} K^{\pm} X$
2535 ±0.6 ±1	75	FRABETTI	94B	E687	γ Be $\to D^{*+} K^0 X$, $D^{*0} K^+ X$
2535.2 ±0.5 ±1.5	28	ALBRECHT	92R	ARG	10.4 $e^+ e^- \to D^{*0} K^+ X$
2536.6 ±0.7 ±0.4		AVERY	90	CLEO	$e^+ e^- \to D^{*+} K^0 X$
2535.9 ±0.6 ±2.0		ALBRECHT	89E	ARG	$D_{s1}^* \to D^*(2010) K^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2534.1 ±0.6	116	[4] AUSHEV	11	BELL	$B \to D_{s1}(2536)^+ D^{(*)}$
2535.08±0.01±0.15	8038	[5] LEES	11B	BABR	10.6 $e^+ e^- \to D^{*+} K_S^0 X$
$2535.57^{+0.44}_{-0.41}$±0.10	236	[6] CHEKANOV	09	ZEUS	$e^{\pm} p \to D^{*+} K_S^0 X$, $D^{*0} K^+ X$
2535.3 ±0.2 ±0.5	134	[7] ALEXANDER	93	CLE2	$e^+ e^- \to D^{*0} K^+ X$
2534.8 ±0.6 ±0.6	44	[8] ALEXANDER	93	CLE2	$e^+ e^- \to D^{*+} K^0 X$
2535 ± 28		[9] ASRATYAN	88	HLBC	$\nu N \to D_s \gamma\gamma X$

[1] From a fit of the D_s^+ recoil mass distribution with an incoherent sum of the S-wave and D-wave Breit-Wigner line shapes.
[2] Using the $D^*(2010)^{\pm}$ mass of 2010.0 ± 0.4 MeV from PDG 06.
[3] Calculated using $m(D^*(2010)^{\pm}) = 2010.0 \pm 0.5$ MeV, $m(D^*(2007)^0) = 2006.7 \pm 0.5$ MeV, and the mass difference below.
[4] Systematic uncertainties not evaluated.
[5] Calculated using the mass difference $m(D_{s1}^+) - m(D^{*+})_{PDG}$ below and $m(D^{*+})_{PDG}$ = 2010.25 ± 0.14 MeV. Assuming S-wave decay of the $D_{s1}(2536)$ to $D^{*+} K_S^0$, using a Breit-Wigner line shape corresponding to L=0.

[6] Calculated using the mass difference $m(D_{s1}^+) - m(D^{*+})_{PDG}$ reported below and $m(D^{*+})_{PDG} = 2010.27 \pm 0.17$ MeV.
[7] Calculated using $m(D^*(2007)^0)$=2006.6 ± 0.5 MeV and the mass difference below.
[8] Calculated using $m(D^*(2010)^\pm)$=2010.1 ± 0.6 MeV and the mass difference below.
[9] Not seen in $D^* K$.

$m_{D_{s1}(2536)^\pm} - m_{D_s^*(2111)}$

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)	DOCUMENT ID		TECN	COMMENT
422.9± 0.4 OUR FIT				
424 ±28	ASRATYAN	88	HLBC	$D_s^{*\pm}\gamma$

$m_{D_{s1}(2536)^\pm} - m_{D^*(2010)^\pm}$

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
524.85±0.04 OUR FIT					
524.84±0.04 OUR AVERAGE					
524.83±0.01±0.04	8038	[10] LEES	11B	BABR	10.6 $e^+e^- \to D^{*+}K_S^0 X$
$525.30^{+0.44}_{-0.41}$±0.10	236 ± 30	CHEKANOV	09	ZEUS	$e^\pm p \to D^{*+}K_S^0 X$, $D^{*0}K^+X$
525.3 ±0.6 ±0.1	41	HEISTER	02B	ALEP	$e^+e^- \to D^{*+}K^0 X$
524.7 ±0.6 ±0.2	44	ALEXANDER	93	CLE2	$e^+e^- \to D^{*+}K_S^0 X$

[10] Assuming S-wave decay of the $D_{s1}(2536)$ to $D^{*+}K_S^0$, using a Breit-Wigner line shape corresponding to L=0.

$m_{D_{s1}(2536)^\pm} - m_{D^*(2007)^0}$

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
528.26±0.05 OUR FIT Error includes scale factor of 1.2.					
528.68±0.28 OUR AVERAGE					
528.7 ±1.9 ±0.5	51	HEISTER	02B	ALEP	$e^+e^- \to D^{*0}K^+X$
527.3 ±2.2	29	ACKERSTAFF	97W	OPAL	$e^+e^- \to D^{*0}K^+X$
528.7 ±0.2 ±0.2	134	ALEXANDER	93	CLE2	$e^+e^- \to D^{*0}K^+X$

$D_{s1}(2536)^\pm$ WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
0.92±0.05 OUR AVERAGE						
1.7 ±1.2 ±0.6		24	[11] ABLIKIM	19P	BES3	4.6 $e^+e^- \to D_s^+\overline{D}^0 K^-$
0.92±0.03±0.04		8038	[12] LEES	11B	BABR	10.6 $e^+e^- \to D^{*+}K_S^0 X$

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

0.75±0.23		116	[13] AUSHEV	11	BELL	$B \to D_{s1}(2536)^+ D^{(*)}$
< 2.5	95	193	AUBERT	06P	BABR	10.6 $e^+ e^- \to D_s^+ \pi^+ \pi^- X$
< 3.2	90	75	FRABETTI	94B	E687	γ Be $\to D^{*+} K^0$ X, $D^{*0} K^+$ X
< 2.3	90		ALEXANDER	93	CLEO	$e^+ e^- \to D^{*0} K^+$ X
< 3.9	90		ALBRECHT	92R	ARG	10.4 $e^+ e^- \to D^{*0} K^+$ X
< 5.44	90		AVERY	90	CLEO	$e^+ e^- \to D^{*+} K^0$ X
< 4.6	90		ALBRECHT	89E	ARG	$D_{s1}^* \to D^*(2010) K^0$

[11] From a fit of the D_s^+ recoil mass distribution with an incoherent sum of the S-wave and S-wave Breit-Wigner line shapes.

[12] Assuming S-wave decay of the $D_{s1}(2536)$ to $D^{*+} K_S^0$, using a Breit-Wigner line shape corresponding to L=0.

[13] Systematic uncertainties not evaluated.

$D_{s1}(2536)^+$ DECAY MODES

$D_{s1}(2536)^-$ modes are charge conjugates of the modes below.

	Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1	$D^*(2010)^+ K^0$	0.85 ±0.12	
Γ_2	$(D^*(2010)^+ K^0)_{S-wave}$	0.61 ±0.09	
Γ_3	$(D^*(2010)^+ K^0)_{D-wave}$		
Γ_4	$D^+ \pi^- K^+$	0.028±0.005	
Γ_5	$D^*(2007)^0 K^+$	**DEFINED AS 1**	
Γ_6	$D^+ K^0$	<0.34	90%
Γ_7	$D^0 K^+$	<0.12	90%
Γ_8	$D_s^{*+} \gamma$	possibly seen	
Γ_9	$D_s^+ \pi^+ \pi^-$	seen	

$D_{s1}(2536)^+$ BRANCHING RATIOS

$\Gamma(D^*(2007)^0 K^+)/\Gamma(D^*(2010)^+ K^0)$ — Γ_5/Γ_1

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.18±0.16 OUR AVERAGE					
0.88±0.24±0.08	116	AUSHEV	11	BELL	$B \to D_{s1}(2536)^+ D^{(*)}$
2.3 ±0.6 ±0.3	236 ± 30	CHEKANOV	09	ZEUS	$e^\pm p \to D^{*+} K_S^0 X$, $D^{*0} K^+ X$
1.32±0.47±0.23	92	[14] HEISTER	02B	ALEP	$e^+ e^- \to D^{*+} K^0 X$, $D^{*0} K^+ X$
1.9 $^{+1.1}_{-0.9}$ ±0.4	35	[14] ACKERSTAFF	97W	OPAL	$e^+ e^- \to D^{*0} K^+$ X, $D^{*+} K^0$ X
1.1 ±0.3		ALEXANDER	93	CLEO	$e^+ e^- \to D^{*0} K^+$ X, $D^{*+} K^0$ X
1.4 ±0.3 ±0.2		[15] ALBRECHT	92R	ARG	10.4 $e^+ e^- \to D^{*0} K^+$ X, $D^{*+} K^0$ X

[14] Ratio of the production rates measured in Z^0 decays.
[15] Evaluated by us from published inclusive cross-sections.

$\Gamma((D^*(2010)^+ K^0)_{S-wave})/\Gamma(D^*(2010)^+ K^0)$ — Γ_2/Γ_1

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.72±0.05±0.01	5485	BALAGURA	08	BELL	10.6 $e^+ e^- \to D^{*+} K^0 X$

$\Gamma(D^+ \pi^- K^+)/\Gamma(D^*(2010)^+ K^0)$ — Γ_4/Γ_1

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
3.27±0.18±0.37	1264	BALAGURA	08	BELL	10.6 $e^+ e^- \to D^+ \pi^- K^+ X$

$\Gamma(D^+ K^0)/\Gamma(D^*(2010)^+ K^0)$ — Γ_6/Γ_1

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.40	90	ALEXANDER	93	CLEO	$e^+ e^- \to D^{*+} K^0 X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.43	90	ALBRECHT	89E	ARG	$D^*_{s1} \to D^*(2010) K^0$

$\Gamma(D^0 K^+)/\Gamma(D^*(2007)^0 K^+)$ — Γ_7/Γ_5

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.12	90	ALEXANDER	93	CLEO	$e^+ e^- \to D^{*0} K^+ X$

$\Gamma(D_s^{*+} \gamma)/\Gamma_{total}$ — Γ_8/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
possibly seen	ASRATYAN	88	HLBC	$\nu N \to D_s \gamma \gamma X$

$\Gamma(D_s^{*+} \gamma)/\Gamma(D^*(2007)^0 K^+)$ — Γ_8/Γ_5

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.42	90	ALEXANDER	93	CLEO	$e^+ e^- \to D^{*0} K^+ X$

$\Gamma(D_s^+ \pi^+ \pi^-)/\Gamma_{total}$ — Γ_9/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	AUBERT	06P	BABR	10.6 $e^+ e^- \to D_s^+ \pi^+ \pi^- X$

$D_{s1}(2536)^{\pm}$ REFERENCES

ABLIKIM	19P	CP C43 031001	M. Ablikim et al.	(BESIII Collab.)
AUSHEV	11	PR D83 051102	T. Aushev et al.	(BELLE Collab.)
LEES	11B	PR D83 072003	J.P. Lees et al.	(BABAR Collab.)
ABAZOV	09G	PRL 102 051801	V.M. Abazov et al.	(D0 Collab.)
CHEKANOV	09	EPJ C60 25	S. Chekanov et al.	(ZEUS Collab.)
AUBERT	08B	PR D77 011102	B. Aubert et al.	(BABAR Collab.)
BALAGURA	08	PR D77 032001	V. Balagura et al.	(BELLE Collab.)
AUBERT	06P	PR D74 032007	B. Aubert et al.	(BABAR Collab.)
PDG	06	JP G33 1	W.-M. Yao et al.	(PDG Collab.)
HEISTER	02B	PL B526 34	A. Heister et al.	(ALEPH Collab.)
ACKERSTAFF	97W	ZPHY C76 425	K. Ackerstaff et al.	(OPAL Collab.)
ASRATYAN	94	ZPHY C61 563	A.E. Asratyan et al.	(BIRM, BELG, CERN+)
FRABETTI	94B	PRL 72 324	P.L. Frabetti et al.	(FNAL E687 Collab.)
ALEXANDER	93	PL B303 377	J. Alexander et al.	(CLEO Collab.)
ALBRECHT	92R	PL B297 425	H. Albrecht et al.	(ARGUS Collab.)
AVERY	90	PR D41 774	P. Avery, D. Besson	(CLEO Collab.)
ALBRECHT	89E	PL B230 162	H. Albrecht et al.	(ARGUS Collab.)
ASRATYAN	88	ZPHY C40 483	A.E. Asratyan et al.	(ITEP, SERP)