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

$I(J^P) = 0(1^+)$
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
2535.12±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	γBe $\to D^{*+} K^0 X$, $D^{*0} K^+ X$
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 $e^+e^- \rightarrow D^{*+}K_S^0X$
$525.30^{+0.44}_{-0.41}$±0.10	236 ± 30	CHEKANOV	09	ZEUS	$e^\pm p \rightarrow D^{*+}K_S^0X$, $D^{*0}K^+X$
525.3 ±0.6 ±0.1	41	HEISTER	02B	ALEP	$e^+e^- \rightarrow D^{*+}K^0X$
524.7 ±0.6 ±0.2	44	ALEXANDER	93	CLE2	$e^+e^- \rightarrow D^{*+}K_S^0$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 1.1.				
528.68±0.28 OUR AVERAGE					
528.7 ±1.9 ±0.5	51	HEISTER	02B	ALEP	$e^+e^- \rightarrow D^{*0}K^+X$
527.3 ±2.2	29	ACKERSTAFF	97W	OPAL	$e^+e^- \rightarrow D^{*0}K^+$X
528.7 ±0.2 ±0.2	134	ALEXANDER	93	CLE2	$e^+e^- \rightarrow D^{*0}K^+$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 $e^+e^- \rightarrow D_s^+\overline{D}^0K^-$
0.92±0.03±0.04		8038	[12] LEES	11B	BABR	10.6 $e^+e^- \rightarrow D^{*+}K_S^0X$

• • • 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

Branching fractions are given relative to the one **DEFINED AS 1**. $D_{s1}(2536)^-$ modes are charge conjugates of the modes below.

	Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1	$D^*(2010)^+ K^0$	(31 ± 7) %	
Γ_2	$(D^*(2010)^+ K^0)_{S-wave}$	(22 ± 5) %	
Γ_3	$(D^*(2010)^+ K^0)_{D-wave}$		
Γ_4	$K_S^0 D^*(2010)^+$	(17 ± 4) %	
Γ_5	$D^+ \pi^- K^+$	$(10.0 \pm 2.5) \times 10^{-3}$	
Γ_6	$D^*(2007)^0 K^+$	(36 ± 6) %	
Γ_7	$D^+ K^0$	< 12 %	90%
Γ_8	$D^0 K^+$	< 4 %	90%
Γ_9	$D_s^{*+} \gamma$	possibly seen	
Γ_{10}	$D_s^+ \pi^+ \pi^-$	seen	

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

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

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

$\Gamma(K_S^0 D^*(2010)^+)/\Gamma(D^*(2007)^0 K^+)$ — Γ_4/Γ_6

VALUE	DOCUMENT ID		TECN	COMMENT
$0.48 \pm 0.07 \pm 0.02$	GAO	23	BELL	$e^+ e^-$ at 10.52 GeV

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

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

$\Gamma(D^*(2007)^0 K^+)/\Gamma_{total}$ Γ_6/Γ

VALUE (%)	DOCUMENT ID		TECN	COMMENT
35.9±4.8±3.5	[14] ABLIKIM	24BN	BES3	$e^+ e^- \rightarrow D_s^+ D_{s1}(2536)^-$

[14] Determined as ratio of exclusive $e^+ e^- \rightarrow D_s^+ [\overline{D}^{*0} K^-]$ and inclusive $e^+ e^- \rightarrow D_s^+ X$ measurements.

$\Gamma(D^*(2007)^0 K^+)/\Gamma(D^*(2010)^+ K^0)$ Γ_6/Γ_1

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.18±0.16 OUR AVERAGE					
0.88±0.24±0.08	116	AUSHEV	11	BELL	$B \rightarrow D_{s1}(2536)^+ D^{(*)}$
2.3 ±0.6 ±0.3	236 ± 30	CHEKANOV	09	ZEUS	$e^{\pm} p \rightarrow D^{*+} K_S^0 X$, $D^{*0} K^+ X$
1.32±0.47±0.23	92	[15] HEISTER	02B	ALEP	$e^+ e^- \rightarrow D^{*+} K^0 X$, $D^{*0} K^+ X$
1.9 $^{+1.1}_{-0.9}$ ±0.4	35	[15] ACKERSTAFF	97W	OPAL	$e^+ e^- \rightarrow D^{*0} K^+ X$, $D^{*+} K^0 X$
1.1 ±0.3		ALEXANDER	93	CLEO	$e^+ e^- \rightarrow D^{*0} K^+ X, D^{*+} K^0 X$
1.4 ±0.3 ±0.2		[16] ALBRECHT	92R	ARG	10.4 $e^+ e^- \rightarrow D^{*0} K^+ X, D^{*+} K^0 X$

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

$\Gamma(D^+ K^0)/\Gamma(D^*(2010)^+ K^0)$ Γ_7/Γ_1

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

$\Gamma(D^0 K^+)/\Gamma(D^*(2007)^0 K^+)$ Γ_8/Γ_6

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

$\Gamma(D_s^{*+} \gamma)/\Gamma_{total}$ Γ_9/Γ

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

$\Gamma(D_s^{*+} \gamma)/\Gamma(D^*(2007)^0 K^+)$ Γ_9/Γ_6

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

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

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

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

ABLIKIM	24BN	PRL 133 171903	M. Ablikim *et al.*	(BESIII Collab.)
GAO	23	PR D108 112015	B.S. Gao *et al.*	(BELLE Collab.)
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)