$\Upsilon(1S)$

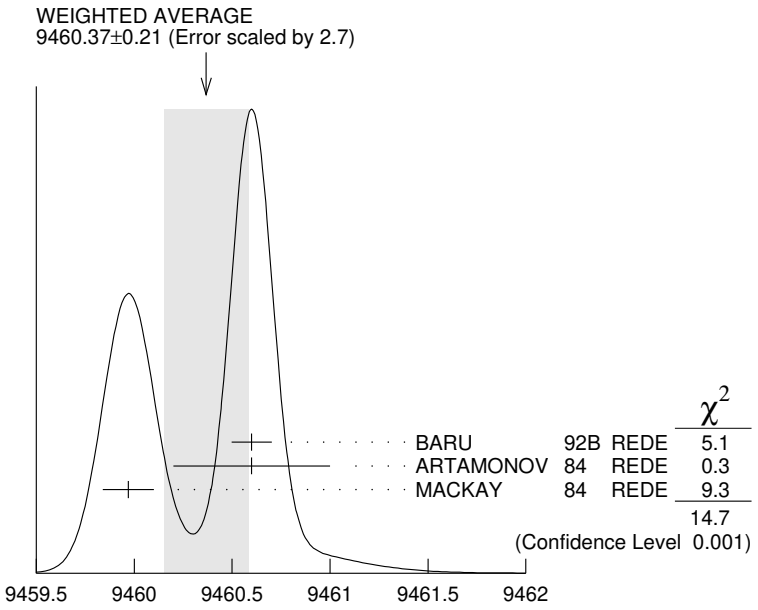
$I^G(J^{PC}) = 0^-(1^{--})$

$\Upsilon(1S)$ MASS

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
9460.37±0.21 OUR AVERAGE	Error includes scale factor of 2.7. See the ideogram below.			
9460.60±0.09±0.05	[1] BARU	92B	REDE	$e^+e^- \to$ hadrons
9460.6 ±0.4	[2] ARTAMONOV	84	REDE	$e^+e^- \to$ hadrons
9459.97±0.11±0.07	MACKAY	84	REDE	$e^+e^- \to$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •				
9460.59±0.12	BARU	86	REDE	$e^+e^- \to$ hadrons

[1] Superseding BARU 86.

[2] Value includes data of ARTAMONOV 82.



$\Upsilon(1S)$ WIDTH

VALUE (keV)	*DOCUMENT ID*	
52.5±1.8 OUR EVALUATION	See the Note on Width Determinations of the Υ states	

$\Upsilon(1S)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1	$\tau^+\tau^-$	$(2.67^{+0.14}_{-0.16})$ %	
Γ_2	e^+e^-	(2.52 ± 0.17) %	
Γ_3	$\mu^+\mu^-$	(2.48 ± 0.07) %	S=1.1
	Hadronic decays		
Γ_4	$J/\psi(1S)$anything	$(1.1\ \pm0.4\ )\times10^{-3}$	
Γ_5	$\rho\pi$	$<2\times10^{-4}$	CL=90%
Γ_6	$\pi^+\pi^-$	$<5\times10^{-4}$	CL=90%
Γ_7	K^+K^-	$<5\times10^{-4}$	CL=90%
Γ_8	$p\overline{p}$	$<5\times10^{-4}$	CL=90%
Γ_9	$D^*(2010)^\pm$ anything		
	Radiative decays		
Γ_{10}	$\gamma 2h^+2h^-$	$(7.0\ \pm1.5\ )\times10^{-4}$	
Γ_{11}	$\gamma 3h^+3h^-$	$(5.4\ \pm2.0\ )\times10^{-4}$	
Γ_{12}	$\gamma 4h^+4h^-$	$(7.4\ \pm3.5\ )\times10^{-4}$	
Γ_{13}	$\gamma\pi^+\pi^-K^+K^-$	$(2.9\ \pm0.9\ )\times10^{-4}$	
Γ_{14}	$\gamma 2\pi^+2\pi^-$	$(2.5\ \pm0.9\ )\times10^{-4}$	
Γ_{15}	$\gamma 3\pi^+3\pi^-$	$(2.5\ \pm1.2\ )\times10^{-4}$	
Γ_{16}	$\gamma 2\pi^+2\pi^-K^+K^-$	$(2.4\ \pm1.2\ )\times10^{-4}$	
Γ_{17}	$\gamma\pi^+\pi^-p\overline{p}$	$(1.5\ \pm0.6\ )\times10^{-4}$	
Γ_{18}	$\gamma 2\pi^+2\pi^-p\overline{p}$	$(4\ \ \pm6\ \ )\times10^{-5}$	
Γ_{19}	$\gamma 2K^+2K^-$	$(2.0\ \pm2.0\ )\times10^{-5}$	
Γ_{20}	$\gamma\eta'(958)$	$<1.3\times10^{-3}$	CL=90%
Γ_{21}	$\gamma\eta$	$<3.5\times10^{-4}$	CL=90%
Γ_{22}	$\gamma f_2'(1525)$	$<1.4\times10^{-4}$	CL=90%
Γ_{23}	$\gamma f_2(1270)$	$<1.3\times10^{-4}$	CL=90%
Γ_{24}	$\gamma\eta(1440)$	$<8.2\times10^{-5}$	CL=90%
Γ_{25}	$\gamma f_J(1710)\rightarrow\ \gamma K\overline{K}$	$<2.6\times10^{-4}$	CL=90%
Γ_{26}	$\gamma f_0(2200)\rightarrow\ \gamma K^+K^-$	$<2\times10^{-4}$	CL=90%
Γ_{27}	$\gamma f_J(2220)\rightarrow\ \gamma K^+K^-$	$<1.5\times10^{-5}$	CL=90%
Γ_{28}	$\gamma\eta(2225)\rightarrow\ \gamma\phi\phi$	$<3\times10^{-3}$	CL=90%
Γ_{29}	γX (X = pseudoscalar with $m<7.2$ GeV)	$<3\times10^{-5}$	CL=90%
Γ_{30}	$\gamma X\overline{X}$ ($X\overline{X}$ = vectors with $m<3.1$ GeV)	$<1\times10^{-3}$	CL=90%

$\Upsilon(1S)$ Γ(i)$\Gamma(e^+e^-)/\Gamma$(total)

$\Gamma(e^+e^-)\times\Gamma(\mu^+\mu^-)/\Gamma_{\rm total}$ $\quad\Gamma_2\Gamma_3/\Gamma$

VALUE (eV)	*DOCUMENT ID*		*TECN*	*COMMENT*
31.2±1.6±1.7	KOBEL	92	CBAL	$e^+e^-\rightarrow\ \mu^+\mu^-$

$\Gamma(\text{hadrons}) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ — $\Gamma_0\Gamma_2/\Gamma$

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
1.216±0.027 OUR AVERAGE				
1.187±0.023±0.031	[3] BARU	92B	MD1	$e^+e^- \to$ hadrons
1.23 ±0.02 ±0.05	[3] JAKUBOWSKI	88	CBAL	$e^+e^- \to$ hadrons
1.37 ±0.06 ±0.09	[4] GILES	84B	CLEO	$e^+e^- \to$ hadrons
1.23 ±0.08 ±0.04	[4] ALBRECHT	82	DASP	$e^+e^- \to$ hadrons
1.13 ±0.07 ±0.11	[4] NICZYPORUK	82	LENA	$e^+e^- \to$ hadrons
1.09 ±0.25	[4] BOCK	80	CNTR	$e^+e^- \to$ hadrons
1.35 ±0.14	[5] BERGER	79	PLUT	$e^+e^- \to$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.17 ±0.06 ±0.10	[4] TUTS	83	CUSB	$e^+e^- \to$ hadrons

[3] Radiative corrections evaluated following KURAEV 85.
[4] Radiative corrections reevaluated by BUCHMUELLER 88 following KURAEV 85.
[5] Radiative corrections reevaluated by ALEXANDER 89 using B($\mu\mu$) = 0.026.

$\Upsilon(1S)$ PARTIAL WIDTHS

$\Gamma(e^+e^-)$ — Γ_2

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
1.32±0.04±0.03	[6] ALBRECHT	95E	ARG	$e^+e^- \to$ hadrons

[6] Applying the formula of Kuraev and Fadin.

$\Upsilon(1S)$ BRANCHING RATIOS

$\Gamma(\tau^+\tau^-)/\Gamma_{\text{total}}$ — Γ_1/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$0.0267^{+0.0014}_{-0.0016}$ OUR AVERAGE					
$0.0261\pm0.0012^{+0.0009}_{-0.0013}$	25k	CINABRO	94B	CLE2	$e^+e^- \to \tau^+\tau^-$
0.027 ±0.004 ±0.002		[7] ALBRECHT	85C	ARG	$\Upsilon(2S) \to \pi^+\pi^-\tau^+\tau^-$
0.034 ±0.004 ±0.004		GILES	83	CLEO	$e^+e^- \to \tau^+\tau^-$

[7] Using B($\Upsilon(1S) \to e\,e$) = B($\Upsilon(1S) \to \mu\mu$) = 0.0256; not used for width evaluations.

$\Gamma(\mu^+\mu^-)/\Gamma_{\text{total}}$ — Γ_3/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0248±0.0007 OUR AVERAGE Error includes scale factor of 1.1.					
0.0212±0.0020±0.0010		[8] BARU	92	MD1	$e^+e^- \to \mu^+\mu^-$
0.0231±0.0012±0.0010		[8] KOBEL	92	CBAL	$e^+e^- \to \mu^+\mu^-$
0.0252±0.0007±0.0007		CHEN	89B	CLEO	$e^+e^- \to \mu^+\mu^-$
0.0261±0.0009±0.0011		KAARSBERG	89	CSB2	$e^+e^- \to \mu^+\mu^-$
0.0230±0.0025±0.0013	86	ALBRECHT	87	ARG	$\Upsilon(2S) \to \pi^+\pi^-\mu^+\mu^-$

0.029 ±0.003 ±0.002	864	BESSON	84	CLEO	$\Upsilon(2S) \to \pi^+\pi^-\mu^+\mu^-$	
0.027 ±0.003 ±0.003		ANDREWS	83	CLEO	$e^+e^- \to \mu^+\mu^-$	
0.032 ±0.013 ±0.003		ALBRECHT	82	DASP	$e^+e^- \to \mu^+\mu^-$	
0.038 ±0.015 ±0.002		NICZYPORUK	82	LENA	$e^+e^- \to \mu^+\mu^-$	
0.014 $^{+0.034}_{-0.014}$		BOCK	80	CNTR	$e^+e^- \to \mu^+\mu^-$	
0.022 ±0.020		BERGER	79	PLUT	$e^+e^- \to \mu^+\mu^-$	

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

0.027 ±0.003 ±0.003	TUTS	83	CUSB	$e^+e^- \to \mu^+\mu^-$	

[8] Taking into account interference between the resonance and continuum.

$\Gamma(e^+e^-)/\Gamma_{total}$ Γ_2/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.0252±0.0017 OUR AVERAGE					
0.0242±0.0014±0.0014	307	ALBRECHT	87	ARG	$\Upsilon(2S) \to \pi^+\pi^- e^+e^-$
0.028 ±0.003 ±0.002	826	BESSON	84	CLEO	$\Upsilon(2S) \to \pi^+\pi^- e^+e^-$
0.051 ±0.030		BERGER	80C	PLUT	$e^+e^- \to e^+e^-$

$\Gamma(J/\psi(1S)\text{anything})/\Gamma_{total}$ Γ_4/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
< 0.68	90	ALBRECHT	92J	ARG	$e^+e^- \to e^+e^-$X, $e^+e^- \to \mu^+\mu^-$X
1.1 ±0.4±0.2		[9] FULTON	89	CLEO	$e^+e^- \to \mu^+\mu^-$X

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

< 1.7	90	MASCHMANN	90	CBAL	$e^+e^- \to$ hadrons
<20	90	NICZYPORUK	83	LENA	

[9] Using B($(J/\psi) \to \mu^+\mu^-$) = (6.9 ± 0.9)%.

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

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<5	90	BARU	92	MD1	$\Upsilon(1S) \to \pi^+\pi^-$

$\Gamma(K^+K^-)/\Gamma_{total}$ Γ_7/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<5	90	BARU	92	MD1	$\Upsilon(1S) \to K^+K^-$

$\Gamma(p\bar{p})/\Gamma_{total}$ Γ_8/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<5	90	[10] BARU	96	MD1	$\Upsilon(1S) \to p\bar{p}$

[10] Supersedes BARU 92 in this node.

$\Gamma(\gamma X)/\Gamma_{total}$ Γ_{29}/Γ

(X = pseudoscalar with $m < 7.2$ GeV)

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<3	90	[11] BALEST	95	CLEO	$e^+e^- \to \gamma +$ X

[11] For a noninteracting pseudoscalar X with mass < 7.2 GeV.

$\Gamma(\gamma X\overline{X})/\Gamma_{total}$ Γ_{30}/Γ

($X\overline{X}$ = vectors with $m < 3.1$ GeV)

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<1	90	[12] BALEST	95	CLEO	$e^+e^- \to \gamma +$ $X\overline{X}$

[12] For a noninteracting vector X with mass < 3.1 GeV.

$\Gamma(\gamma 2\pi^+ 2\pi^-)/\Gamma_{total}$ Γ_{14}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.5±0.7±0.5	26 ± 7	FULTON	90B	CLEO	$e^+e^- \to$ hadrons

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

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.9±0.7±0.6	29 ± 8	FULTON	90B	CLEO	$e^+e^- \to$ hadrons

$\Gamma(\gamma \pi^+\pi^- p\overline{p})/\Gamma_{total}$ Γ_{17}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
1.5±0.5±0.3	22 ± 6	FULTON	90B	CLEO	$e^+e^- \to$ hadrons

$\Gamma(\gamma 2K^+ 2K^-)/\Gamma_{total}$ Γ_{19}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
0.2 ±0.2	2 ± 2	FULTON	90B	CLEO	$e^+e^- \to$ hadrons

$\Gamma(\gamma 3\pi^+ 3\pi^-)/\Gamma_{total}$ Γ_{15}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.5±0.9±0.8	17 ± 5	FULTON	90B	CLEO	$e^+e^- \to$ hadrons

$\Gamma(\gamma 2\pi^+ 2\pi^- K^+K^-)/\Gamma_{total}$ Γ_{16}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.4±0.9±0.8	18 ± 7	FULTON	90B	CLEO	$e^+e^- \to$ hadrons

$\Gamma(\gamma 2\pi^+ 2\pi^- p\overline{p})/\Gamma_{total}$ Γ_{18}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
0.4±0.4±0.4	7 ± 6	FULTON	90B	CLEO	$e^+e^- \to$ hadrons

$\Gamma(\gamma 2h^+ 2h^-)/\Gamma_{total}$ Γ_{10}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
7.0±1.1±1.0	80 ± 12	FULTON	90B	CLEO	$e^+e^- \to$ hadrons

$\Gamma(\gamma 3h^+ 3h^-)/\Gamma_{total}$ Γ_{11}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
5.4±1.5±1.3	39 ± 11	FULTON	90B	CLEO	$e^+ e^- \rightarrow$ hadrons

$\Gamma(\gamma 4h^+ 4h^-)/\Gamma_{total}$ Γ_{12}/Γ

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
7.4±2.5±2.5	36 ± 12	FULTON	90B	CLEO	$e^+ e^- \rightarrow$ hadrons

$\Gamma(\rho\pi)/\Gamma_{total}$ Γ_5/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
< 2	90	FULTON	90B		$\Upsilon(1S) \rightarrow \rho^0\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<10	90	BLINOV	90	MD1	$\Upsilon(1S) \rightarrow \rho^0\pi^0$
<21	90	NICZYPORUK	83	LENA	$\Upsilon(1S) \rightarrow \rho^0\pi^0$

$\Gamma(D^*(2010)^\pm \text{anything})/\Gamma_{total}$ Γ_9/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<19	90	[13] ALBRECHT	92J	ARG	$e^+ e^- \rightarrow D^0\pi^\pm$ X

[13] For $x_p > 0.2$.

$\Gamma(\gamma\eta(1440))/\Gamma_{total}$ Γ_{24}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<8.2	90	[14] FULTON	90B	CLEO	$\Upsilon(1S) \rightarrow \gamma K^+\pi^\mp K^0_S$

[14] Includes unknown branching ratio of $\eta(1440) \rightarrow K^\pm\pi^\mp K^0_S$.

$\Gamma(\gamma\eta'(958))/\Gamma_{total}$ Γ_{20}/Γ

VALUE (units 10^{-3})	CL%	DOCUMENT ID		TECN	COMMENT
<1.3	90	SCHMITT	88	CBAL	$\Upsilon(1S) \rightarrow \gamma$ X

$\Gamma(\gamma\eta)/\Gamma_{total}$ Γ_{21}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<3.5	90	SCHMITT	88	CBAL	$\Upsilon(1S) \rightarrow \gamma$ X

$\Gamma(\gamma f_2'(1525))/\Gamma_{total}$ Γ_{22}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<14	90	[15] FULTON	90B	CLEO	$\Upsilon(1S) \rightarrow \gamma K^+ K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<19.4	90	[15] ALBRECHT	89	ARG	$\Upsilon(1S) \rightarrow \gamma K^+ K^-$

[15] Assuming $B(f_2'(1525) \rightarrow K\overline{K}) = 0.71$.

$\Gamma(\gamma f_J(1710) \to \gamma K\overline{K})/\Gamma_{total}$ Γ_{25}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
< 2.6	90	[16] ALBRECHT	89	ARG	$\Upsilon(1S) \to \gamma K^+ K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 6.3	90	[16] FULTON	90B	CLEO	$\Upsilon(1S) \to \gamma K^+ K^-$
<19	90	[16] FULTON	90B	CLEO	$\Upsilon(1S) \to \gamma K^0_S K^0_S$
< 8	90	[17] ALBRECHT	89	ARG	$\Upsilon(1S) \to \gamma \pi^+ \pi^-$
<24	90	[18] SCHMITT	88	CBAL	$\Upsilon(1S) \to \gamma X$

[16] Assuming B($f_J(1710) \to K\overline{K}$) = 0.38.
[17] Assuming B($f_J(1710) \to \pi\pi$) = 0.04.
[18] Assuming B($f_J(1710) \to \eta\eta$) = 0.18.

$\Gamma(\gamma f_2(1270))/\Gamma_{total}$ Γ_{23}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
<13	90	[19] ALBRECHT	89	ARG	$\Upsilon(1S) \to \gamma \pi^+ \pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<21	90	[19] FULTON	90B	CLEO	$\Upsilon(1S) \to \gamma \pi^+ \pi^-$
<81	90	SCHMITT	88	CBAL	$\Upsilon(1S) \to \gamma X$

[19] Using B($f_2(1270) \to \pi\pi$) = 0.84.

$\Gamma(\gamma f_J(2220) \to \gamma K^+ K^-)/\Gamma_{total}$ Γ_{27}/Γ

VALUE (units 10^{-5})	CL%	DOCUMENT ID		TECN	COMMENT
< 1.5	90	[20] FULTON	90B	CLEO	$\Upsilon(1S) \to \gamma K^+ K^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 2.9	90	[20] ALBRECHT	89	ARG	$\Upsilon(1S) \to \gamma K^+ K^-$
<20	90	[20] BARU	89	MD1	$\Upsilon(1S) \to \gamma K^+ K^-$

[20] Including unknown branching ratio of $f_J(2220) \to K^+ K^-$.

$\Gamma(\gamma\eta(2225) \to \gamma\phi\phi)/\Gamma_{total}$ Γ_{28}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.003	90	[21] BARU	89	MD1	$\Upsilon(1S) \to \gamma K^+ K^- K^+ K^-$

[21] Assuming that the $\eta(2225)$ decays only into $\phi\phi$.

$\Gamma(\gamma f_0(2200) \to \gamma K^+ K^-)/\Gamma_{total}$ Γ_{26}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.0002	90	[22] BARU	89	MD1	$\Upsilon(1S) \to \gamma K^+ K^-$

[22] Assuming that the $f_0(2200)$ decays only into $K^+ K^-$.

$\Upsilon(1S)$ REFERENCES

BARU	96	PRPL 267 71	+Blinov, Blinov, Bondar+	(NOVO)
ALBRECHT	95E	ZPHY C65 619	+Hamacher+	(ARGUS Collab.)
BALEST	95	PR D51 2053	+Cho, Ford, Johnson+	(CLEO Collab.)
CINABRO	94B	PL B340 129	+Liu, Saulnier, Wilson+	(CLEO Collab.)
ALBRECHT	92J	ZPHY C55 25	+Ehrlichmann, Hamacher+	(ARGUS Collab.)
BARU	92	ZPHY C54 229	+Beilin, Blinov+	(NOVO)
BARU	92B	ZPHY C56 547	+Blinov, Blinov, Bondar+	(NOVO)
KOBEL	92	ZPHY C53 193	+Antreasyan, Bartels, Besset+	(Crystal Ball Collab.)
BLINOV	90	PL B245 311	+Bondar+	(NOVO)
FULTON	90B	PR D41 1401	+Hempstead+	(CLEO Collab.)
MASCHMANN	90	ZPHY C46 555	+Antreasyan, Bartels, Besset+	(Crystal Ball Collab.)
ALBRECHT	89	ZPHY C42 349	+Boeckmann, Glaeser, Harder+	(ARGUS Collab.)
ALEXANDER	89	NP B320 45	+Bonvicini, Drell, Frey, Luth	(LBL, MICH, SLAC)
BARU	89	ZPHY C42 505	+Beilin, Blinov, Blinov+	(NOVO)
CHEN	89B	PR D39 3528	+McIlwain, Miller+	(CLEO Collab.)
FULTON	89	PL B224 445	+Haas, Hempstead+	(CLEO Collab.)
KAARSBERG	89	PRL 62 2077	+Heintz+	(CUSB Collab.)
BUCHMUEL...	88	HE e^+e^- Physics 412	Buchmueller, Cooper	(HANN, DESY, MIT)
		Editors: A. Ali and P. Soeding, World Scientific, Singapore		
JAKUBOWSKI	88	ZPHY C40 49	+Antreasyan, Bartels+	(Crystal Ball Collab.) IGJPC
SCHMITT	88	ZPHY C40 199	+Antreasyan+	(Crystal Ball Collab.)
ALBRECHT	87	ZPHY C35 283	+Binder, Boeckmann, Glaeser+	(ARGUS Collab.)
BARU	86	ZPHY C30 551	+Blinov, Bondar, Bukin+	(NOVO)
ALBRECHT	85C	PL 154B 452	+Drescher, Heller+	(ARGUS Collab.)
KURAEV	85	SJNP 41 466	+Fadin	(NOVO)
		Translated from YAF 41 733.		
ARTAMONOV	84	PL 137B 272	+Baru, Blinov, Bondar+	(NOVO)
BESSON	84	PR D30 1433	+Green, Hicks, Namjoshi, Sannes+	(CLEO Collab.)
GILES	84B	PR D29 1285	+Hassard, Hempstead, Kinoshita+	(CLEO Collab.)
MACKAY	84	PR D29 2483	+Hasard, Giles, Hempstead+	(CUSB Collab.)
ANDREWS	83	PRL 50 807	+Avery, Berkelman, Cassel+	(CLEO Collab.)
GILES	83	PRL 50 877	+ (HARV, OSU, ROCH, RUTG, SYRA, VAND+)	
NICZYPORUK	83	ZPHY C17 197	+Jakubowski, Zeludziewicz+	(LENA Collab.)
TUTS	83	Cornell Conf. 284		(CUSB Collab.)
ALBRECHT	82	PL 116B 383	+Hofmann+ (DESY, DORT, HEIDH, LUND, ITEP)	
ARTAMONOV	82	PL 118B 225	+Baru, Blinov, Bondar, Bukin, Groshev+	(NOVO)
NICZYPORUK	82	ZPHY C15 299	+Folger, Bienlein+	(LENA Collab.)
BERGER	80C	PL 93B 497	+Lackas, Raupach+	(PLUTO Collab.)
BOCK	80	ZPHY C6 125	+Blanar, Blum+ (HEIDP, MPIM, DESY, HAMB)	
BERGER	79	ZPHY C1 343	+Alexander+	(PLUTO Collab.)

OTHER RELATED PAPERS

COOPER	86	Berkeley Conf. 67		(MIT)
KOENIGS...	86	DESY 86/136	Koenigsmann	(DESY)
ALBRECHT	84	PL 134B 137	+Drescher, Heller+	(ARGUS Collab.)
ARTAMONOV	84	PL 137B 272	+Baru, Blinov, Bondar+	(NOVO)
ARTAMONOV	82	PL 118B 225	+Baru, Blinov, Bondar, Bukin, Groshev+	(NOVO)
BERGER	78	PL 76B 243	+Alexander, Daum+	(PLUTO Collab.)
BIENLEIN	78	PL 78B 360	+Glawe, Bock, Blanar+ (DESY, HAMB, HEIDP, MPIM)	
DARDEN	78	PL 76B 246	+Hofmann, Schubert+ (DESY, DORT, HEIDH, LUND)	
GARELICK	78	PR D18 945	+Gauthier, Hicks, Oliver+ (NEAS, WASH, TUFTS)	
KAPLAN	78	PRL 40 435	+Appel, Herb, Hom+ (STON, FNAL, COLU)	
YOH	78	PRL 41 684	+Herb, Hom, Lederman+ (COLU, FNAL, STON)	
COBB	77	PL 72B 273	+Iwata, Fabjan+ (BNL, CERN, SYRA, YALE)	
HERB	77	PRL 39 252	+Hom, Lederman, Appel, Ito+ (COLU, FNAL, STON)	
INNES	77	PRL 39 1240	+Appel, Brown, Herb, Hom+ (COLU, FNAL, STON)	