NODE=S014

η

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

NODE=S014

We have omitted some results that have been superseded by later experiments. The omitted results may be found in our 1988 edition Physics Letters **B204** (1988).

η MASS

NODE=S014M

NODE=S014M

Recent measurements resolve the obvious inconsistency in previous η mass measurements in favor of the higher value first reported by NA48 (LAI 02). We use only precise measurements consistent with this higher mass value for our η mass average.

NODE=S014M

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
547.862±0.017 OUR AVERAGE					
547.865±0.031±0.062		NIKOLAEV	14	CRYB	$\gamma p \rightarrow p\eta$
547.873±0.005±0.027	1M	GOSLAWSKI	12	SPEC	$dp \rightarrow {}^3\text{He}\,\eta$
547.874±0.007±0.029		AMBROSINO	07B	KLOE	$e^+e^- \rightarrow \phi \rightarrow \eta\gamma$
547.785±0.017±0.057	16k	MILLER	07	CLEO	$\psi(2S) \rightarrow J/\psi\eta$
547.843±0.030±0.041	1134	LAI	02	NA48	$\eta \rightarrow 3\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
547.311±0.028±0.032		[1] ABDEL-BARY	05	SPEC	$dp \rightarrow {}^3\text{He}\,\eta$
547.12 ±0.06 ±0.25		KRUSCHE	95D	SPEC	$\gamma p \rightarrow \eta p$, threshold
547.30 ±0.15		PLOUIN	92	SPEC	$dp \rightarrow {}^3\text{He}\,\eta$
547.45 ±0.25		DUANE	74	SPEC	$\pi^- p \rightarrow n$ neutrals
548.2 ±0.65		FOSTER	65C	HBC	
549.0 ±0.7	148	FOELSCHE	64	HBC	
548.0 ±1.0	91	ALFF-...	62	HBC	
549.0 ±1.2	53	BASTIEN	62	HBC	

[1] ABDEL-BARY 05 disagrees significantly with recent measurements of similar or better precision. See comment in the header.

NODE=S014M;LINKAGE=AB

η WIDTH

NODE=S014W

NODE=S014W

This is the partial decay rate $\Gamma(\eta \rightarrow \gamma\gamma)$ divided by the fitted branching fraction for that mode. See the note at the start of the $\Gamma(2\gamma)$ data block, next below.

NODE=S014W

VALUE (keV)	*DOCUMENT ID*
1.31±0.05 OUR FIT	

η DECAY MODES

NODE=S014215;NODE=S014

	Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level	
	Neutral modes			NODE=S014;CLUMP=N
Γ_1	neutral modes	(71.95±0.29) %	S=1.3	DESIG=101
Γ_2	2γ	(39.36±0.18) %	S=1.1	DESIG=1
Γ_3	$3\pi^0$	(32.56±0.21) %	S=1.2	DESIG=2
Γ_4	$\pi^0 2\gamma$	(2.55±0.22) $\times 10^{-4}$		DESIG=7
Γ_5	$2\pi^0 2\gamma$	$<$ 1.2 $\times 10^{-3}$	CL=90%	DESIG=105
Γ_6	4γ	$<$ 2.8 $\times 10^{-4}$	CL=90%	DESIG=108
Γ_7	invisible	$<$ 1.0 $\times 10^{-4}$	CL=90%	DESIG=107
	Charged modes			NODE=S014;CLUMP=C
Γ_8	charged modes	(28.05±0.29) %	S=1.3	DESIG=102
Γ_9	$\pi^+\pi^-\pi^0$	(23.02±0.25) %	S=1.2	DESIG=3
Γ_{10}	$\pi^+\pi^-\gamma$	(4.28±0.07) %	S=1.1	DESIG=4
Γ_{11}	$e^+e^-\gamma$	(7.00±0.22) $\times 10^{-3}$	S=1.1	DESIG=8
Γ_{12}	$\mu^+\mu^-\gamma$	(3.1 ±0.4) $\times 10^{-4}$		DESIG=13
Γ_{13}	e^+e^-	$<$ 7 $\times 10^{-7}$	CL=90%	DESIG=16
Γ_{14}	$\mu^+\mu^-$	(5.8 ±0.8) $\times 10^{-6}$		DESIG=12
Γ_{15}	$2e^+2e^-$	(2.40±0.22) $\times 10^{-5}$		DESIG=25

Γ_{16}	$\pi^+\pi^- e^+ e^- (\gamma)$	$(2.68\pm0.11)\times10^{-4}$			DESIG=6
Γ_{17}	$e^+ e^- \mu^+ \mu^-$	$< 1.6 \times10^{-4}$	CL=90%		DESIG=109
Γ_{18}	$2\mu^+ 2\mu^-$	$(5.0 \pm1.3)\times10^{-9}$			DESIG=110
Γ_{19}	$\mu^+\mu^-\pi^+\pi^-$	$< 3.6 \times10^{-4}$	CL=90%		DESIG=111
Γ_{20}	$\pi^+ e^- \overline{\nu}_e +$ c.c.	$< 1.7 \times10^{-4}$	CL=90%		DESIG=112
Γ_{21}	$\pi^+\pi^- 2\gamma$	$< 2.1 \times10^{-3}$			DESIG=11
Γ_{22}	$\pi^+\pi^-\pi^0\gamma$	$< 6 \times10^{-4}$	CL=90%		DESIG=10
Γ_{23}	$\pi^0\mu^+\mu^-\gamma$	$< 3 \times10^{-6}$	CL=90%		DESIG=17

Charge conjugation (C), Parity (P), Charge conjugation × Parity (CP), or Lepton Family number (LF) violating modes

NODE=S014;CLUMP=A

Γ_{24}	$\pi^0\gamma$	C	[a] $< 9 \times10^{-5}$	CL=90%	DESIG=104
Γ_{25}	$\pi^+\pi^-$	P,CP	$< 4.4 \times10^{-6}$	CL=90%	DESIG=15
Γ_{26}	$2\pi^0$	P,CP	$< 3.5 \times10^{-4}$	CL=90%	DESIG=21
Γ_{27}	$2\pi^0\gamma$	C	$< 5 \times10^{-4}$	CL=90%	DESIG=103
Γ_{28}	$3\pi^0\gamma$	C	$< 6 \times10^{-5}$	CL=90%	DESIG=106
Γ_{29}	3γ	C	$< 1.6 \times10^{-5}$	CL=90%	DESIG=18
Γ_{30}	$4\pi^0$	P,CP	$< 6.9 \times10^{-7}$	CL=90%	DESIG=24
Γ_{31}	$\pi^0 e^+ e^-$	C	[b] $< 8 \times10^{-6}$	CL=90%	DESIG=5
Γ_{32}	$\pi^0\mu^+\mu^-$	C	[b] $< 5 \times10^{-6}$	CL=90%	DESIG=14
Γ_{33}	$\mu^+ e^- + \mu^- e^+$	LF	$< 6 \times10^{-6}$	CL=90%	DESIG=20

[a] Forbidden by angular momentum conservation. LINKAGE=JV

[b] C parity forbids this to occur as a single-photon process. LINKAGE=CS

CONSTRAINED FIT INFORMATION

An overall fit to 2 decay rate and 22 branching ratios uses 55 measurements and one constraint to determine 9 parameters. The overall fit has a $\chi^2 = 46.4$ for 47 degrees of freedom.

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

x_3	12							
x_4	4	0						
x_9	−69	−77	−3					
x_{10}	−48	−53	−2	53				
x_{11}	−4	−4	0	−2	−1			
x_{12}	−1	−1	0	0	0	0		
x_{16}	0	0	0	0	0	0	0	
Γ	−13	−1	−32	9	6	1	0	0
	x_2	x_3	x_4	x_9	x_{10}	x_{11}	x_{12}	x_{16}

	Mode	Rate (keV)	Scale factor	
Γ_2	2γ	0.515 ± 0.018		DESIG=1
Γ_3	$3\pi^0$	0.426 ± 0.015		DESIG=2
Γ_4	$\pi^0 2\gamma$	$(3.34 \pm0.28)\times10^{-4}$		DESIG=7
Γ_9	$\pi^+\pi^-\pi^0$	0.301 ± 0.011		DESIG=3
Γ_{10}	$\pi^+\pi^-\gamma$	0.0559 ± 0.0022		DESIG=4
Γ_{11}	$e^+ e^-\gamma$	0.0092 ± 0.0004	1.1	DESIG=8
Γ_{12}	$\mu^+\mu^-\gamma$	$(4.1 \pm0.5)\times10^{-4}$		DESIG=13
Γ_{16}	$\pi^+\pi^- e^+ e^- (\gamma)$	$(3.51 \pm0.19)\times10^{-4}$		DESIG=6

η DECAY RATES

NODE=S014220

$\Gamma(2\gamma)$ Γ_2

NODE=S014W1

See the table immediately above giving the fitted decay rates. Following the advice of NEFKENS 02, we have removed the Primakoff-effect measurement from the average. See also the "Note on the Decay Width $\Gamma(\eta \to \gamma\gamma)$," in our 1994 edition, Phys. Rev. **D50**, 1 August 1994, Part I, p. 1451, for a discussion of the various measurements.

NODE=S014W1

VALUE (keV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.515±0.018 OUR FIT					
0.516±0.018 OUR AVERAGE					
0.520±0.020±0.013		BABUSCI	13A	KLOE	$e^+e^- \to e^+e^-\eta$
0.51 ±0.12 ±0.05	36	BARU	90	MD1	$e^+e^- \to e^+e^-\eta$
0.490±0.010±0.048	2287	ROE	90	ASP	$e^+e^- \to e^+e^-\eta$
0.514±0.017±0.035	1295	WILLIAMS	88	CBAL	$e^+e^- \to e^+e^-\eta$
0.53 ±0.04 ±0.04		BARTEL	85E	JADE	$e^+e^- \to e^+e^-\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.476±0.062		[1] RODRIGUES	08	CNTR	Reanalysis
0.64 ±0.14 ±0.13		AIHARA	86	TPC	$e^+e^- \to e^+e^-\eta$
0.56 ±0.16	56	WEINSTEIN	83	CBAL	$e^+e^- \to e^+e^-\eta$
0.324±0.046		BROWMAN	74B	CNTR	Primakoff effect
1.00 ±0.22		[2] BEMPORAD	67	CNTR	Primakoff effect

NODE=S014W1

[1] RODRIGUES 08 uses a more sophisticated calculation for the inelastic background due to incoherent photoproduction to reanalyze the η photoproduction data on Be and Cu at 9 GeV from BROWMAN 74B. This brings the value of $\Gamma(\eta \to 2\gamma)$ in line with direct measurements of the width. The error here is only statistical.

NODE=S014W1;LINKAGE=RO

[2] BEMPORAD 67 gives $\Gamma(2\gamma) = 1.21 \pm 0.26$ keV assuming $\Gamma(2\gamma)/\Gamma(\text{total}) = 0.314$. Bemporad private communication gives $\Gamma(2\gamma)^2/\Gamma(\text{total}) = 0.380 \pm 0.083$. We evaluate this using $\Gamma(2\gamma)/\Gamma(\text{total}) = 0.38 \pm 0.01$. Not included in average because the uncertainty resulting from the separation of the coulomb and nuclear amplitudes has apparently been underestimated.

NODE=S014W1;LINKAGE=B

$\Gamma(\pi^0 2\gamma)$ Γ_4

NODE=S014W02
NODE=S014W02

VALUE (eV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.334±0.028 OUR FIT					
0.33 ±0.03	1200	NEFKENS	14	CRYB	$\gamma p \to \eta p$

η BRANCHING RATIOS

NODE=S014225

Neutral modes

NODE=S014310

$\Gamma(\text{neutral modes})/\Gamma_{\text{total}}$ $\Gamma_1/\Gamma = (\Gamma_2+\Gamma_3+\Gamma_4)/\Gamma$

NODE=S014R21
NODE=S014R21

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.7195±0.0029 OUR FIT Error includes scale factor of 1.3.					
0.705 ±0.008	16k	BASILE	71D	CNTR	MM spectrometer
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.79 ±0.08		BUNIATOV	67	OSPK	

$\Gamma(2\gamma)/\Gamma_{\text{total}}$ Γ_2/Γ

NODE=S014R34
NODE=S014R34

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
39.36±0.18 OUR FIT Error includes scale factor of 1.1.					
39.53±0.33 OUR AVERAGE					
39.86±0.04±0.99	2m	[1] ABLIKIM	21AM	BES3	$J/\psi \to \gamma\eta$
39.49±0.17±0.30	65k	ABEGG	96	SPEC	$pd \to {}^3\text{He}\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
38.45±0.40±0.36	14k	[2] LOPEZ	07	CLEO	$\psi(2S) \to J/\psi\eta$

[1] ABLIKIM 21AM normalize the branching ratio $(\eta \to \gamma\gamma)$ to $B(J/\psi \to \gamma\eta)$, which they measured absolutely.

NODE=S014R34;LINKAGE=A

[2] Not independent of other results listed for LOPEZ 07. Assuming decays of $\eta \to \gamma\gamma$, $3\pi^0$, $\pi^+\pi^-\pi^0$, $\pi^+\pi^-\gamma$, and $e^+e^-\gamma$ account for all η decays within a contribution of 0.3% to the systematic error.

NODE=S014R34;LINKAGE=LO

$\Gamma(2\gamma)/\Gamma(\text{neutral modes})$ $\Gamma_2/\Gamma_1 = \Gamma_2/(\Gamma_2+\Gamma_3+\Gamma_4)$

NODE=S014R12
NODE=S014R12

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.5471±0.0018 OUR FIT					
0.548 ±0.023 OUR AVERAGE		Error includes scale factor of 1.5.			
0.535 ±0.018		BUTTRAM	70	OSPK	
0.59 ±0.033		BUNIATOV	67	OSPK	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.52 ±0.09	88	ABROSIMOV	80	HLBC	
0.60 ±0.14	113	KENDALL	74	OSPK	
0.57 ±0.09		STRUGALSKI	71	HLBC	
0.579 ±0.052		FELDMAN	67	OSPK	
0.416 ±0.044		DIGIUGNO	66	CNTR	Error doubled
0.44 ±0.07		GRUNHAUS	66	OSPK	
0.39 ±0.06		[1] JONES	66	CNTR	

[1] This result from combining cross sections from two different experiments.

NODE=S014R12;LINKAGE=T

$\Gamma(3\pi^0)/\Gamma_{total}$ Γ_3/Γ

NODE=S014R52
NODE=S014R52

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
32.56±0.21 OUR FIT	Error includes scale factor of 1.2.				
31.96±0.07±0.84	280k	[1] ABLIKIM	21AM	BES3	$J/\psi \to \gamma\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
34.03±0.56±0.49	1821	[2] LOPEZ	07	CLEO	$\psi(2S) \to J/\psi\eta$

[1] ABLIKIM 21AM normalize the branching ratio ($\eta \to 3\pi^0$) to B($J/\psi \to \gamma\eta$), which they measured absolutely.

NODE=S014R52;LINKAGE=A

[2] Not independent of other results listed for LOPEZ 07. Assuming decays of $\eta \to \gamma\gamma$, $3\pi^0$, $\pi^+\pi^-\pi^0$, $\pi^+\pi^-\gamma$, and $e^+e^-\gamma$ account for all η decays within a contribution of 0.3% to the systematic error.

NODE=S014R52;LINKAGE=LO

$\Gamma(3\pi^0)/\Gamma(\text{neutral modes})$ $\Gamma_3/\Gamma_1 = \Gamma_3/(\Gamma_2+\Gamma_3+\Gamma_4)$

NODE=S014R13
NODE=S014R13

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.4526±0.0019 OUR FIT					
0.439 ±0.024		BUTTRAM	70	OSPK	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.44 ±0.08	75	ABROSIMOV	80	HLBC	
0.32 ±0.09		STRUGALSKI	71	HLBC	
0.41 ±0.033		BUNIATOV	67	OSPK	Not indep. of $\Gamma(2\gamma)/\Gamma(\text{neutral modes})$
0.177 ±0.035		FELDMAN	67	OSPK	
0.209 ±0.054		DIGIUGNO	66	CNTR	Error doubled
0.29 ±0.10		GRUNHAUS	66	OSPK	

$\Gamma(3\pi^0)/\Gamma(2\gamma)$ Γ_3/Γ_2

NODE=S014R6
NODE=S014R6

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.827±0.006 OUR FIT					
0.829±0.007 OUR AVERAGE					
0.884±0.022±0.019	1821	LOPEZ	07	CLEO	$\psi(2S) \to J/\psi\eta$
0.817±0.012±0.032	17.4k	[1] AKHMETSHIN	05	CMD2	$e^+e^- \to \phi \to \eta\gamma$
0.826±0.024		ACHASOV	00D	SND	$e^+e^- \to \phi \to \eta\gamma$
0.832±0.005±0.012		KRUSCHE	95D	SPEC	$\gamma p \to \eta p$, threshold
0.841±0.034		AMSLER	93	CBAR	$\overline{p}p \to \pi^+\pi^-\eta$ at rest
0.822±0.009		ALDE	84	GAM2	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.796±0.016±0.016		ACHASOV	00	SND	See ACHASOV 00D
0.91 ±0.14		COX	70B	HBC	
0.75 ±0.09		DEVONS	70	OSPK	
0.88 ±0.16		BALTAY	67D	DBC	
1.1 ±0.2		CENCE	67	OSPK	
1.25 ±0.39		BACCI	63	CNTR	Inverse BR reported

[1] Uses result from AKHMETSHIN 01B.

NODE=S014R6;LINKAGE=AK

$\Gamma(\pi^0 2\gamma)/\Gamma_{total}$ Γ_4/Γ

NODE=S014R22

Early results are summarized in the review by LANDSBERG 85.

NODE=S014R22
NODE=S014R22

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
2.55±0.22 OUR FIT						
2.21±0.24±0.47		≈ 500	[1] PRAKHOV	08	CRYB	$\pi^- p \to \eta n \approx$ threshold

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

3.5 ±0.7 ±0.6		1.6k	[2,3] PRAKHOV	05	CRYB	See PRAKHOV 08	
<8.4	90	7	ACHASOV	01D	SND	$e^+e^- \to \phi \to \eta\gamma$	
<30	90	0	DAVYDOV	81	GAM2	$\pi^- p \to \eta n$	

[1] PRAKHOV 08 is a reanalysis of the data of PRAKHOV 05, using for the first time the invariant-mass spectrum of the two photons. NODE=S014R22;LINKAGE=PK

[2] Normalized using $\Gamma(\eta \to 2\gamma)/\Gamma = 0.3943 \pm 0.0026$. NODE=S014R22;LINKAGE=PA

[3] This measurement and the independent analysis of the same data by KNECHT 04 both imply a lower value of $\Gamma(\pi^0 2\gamma)$ than the one obtained by ALDE 84 from $\Gamma(\pi^0 2\gamma)/\Gamma(2\gamma)$. NODE=S014R22;LINKAGE=PR

$\Gamma(\pi^0 2\gamma)/\Gamma(2\gamma)$ — Γ_4/Γ_2

NODE=S014R43
NODE=S014R43

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
0.65±0.06 OUR FIT						
1.8 ±0.4		ALDE	84	GAM2	0	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
2.5 ±0.6	70	BINON	82	GAM2		See ALDE 84

$\Gamma(\pi^0 2\gamma)/\Gamma(3\pi^0)$ — Γ_4/Γ_3

NODE=S014R42
NODE=S014R42

VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
7.8±0.7 OUR FIT				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
8.3±2.8±1.4	[1] KNECHT	04	CRYB	$\pi^- p \to n\eta$

[1] Independent analysis of same data as PRAKHOV 05. NODE=S014R42;LINKAGE=KN

$\Gamma(2\pi^0 2\gamma)/\Gamma_{total}$ — Γ_5/Γ

NODE=S014R47
NODE=S014R47

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.2 × 10^{-3}	90	[1] NEFKENS	05A	CRYB	p(720 MeV/c) $\pi^- \to n\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<4.0 × 10^{-3}	90	BLIK	07	GAM4	$\pi^- p \to \eta n$

[1] Measurement is done in limited $\gamma\gamma$ energy range. NODE=S014R47;LINKAGE=NE

$\Gamma(4\gamma)/\Gamma_{total}$ — Γ_6/Γ

NODE=S014R50
NODE=S014R50

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<2.8 × 10^{-4}	90	BLIK	07	GAM4	$\pi^- p \to \eta n$

$\Gamma(\text{invisible})/\Gamma_{total}$ — Γ_7/Γ

NODE=S014R01
NODE=S014R01

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.1 × 10^{-4}	90	[1] ANDREEV	24D	SPEC	π^- + Fe $\to \eta X$

[1] ANDREEV 24D result is based on 2.9 × 10^{9} pions on an active dump target. NODE=S014R01;LINKAGE=A

$\Gamma(\text{invisible})/\Gamma(2\gamma)$ — Γ_7/Γ_2

NODE=S014R49
NODE=S014R49

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<2.6 × 10^{-4}	90	[1] ABLIKIM	13	BES3	$J/\psi \to \phi\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.65 × 10^{-3}	90	[2] ABLIKIM	06Q	BES2	$J/\psi \to \phi\eta$

[1] Based on 225M J/ψ decays. NODE=S014R49;LINKAGE=A

[2] Based on 58M J/ψ decays. NODE=S014R49;LINKAGE=AB

Charged modes

NODE=S014315

$\Gamma(\text{charged modes})/\Gamma_{total}$ — $\Gamma_8/\Gamma = (\Gamma_9+\Gamma_{10}+\Gamma_{11}+\Gamma_{12}+\Gamma_{16})/\Gamma$

NODE=S014R02
NODE=S014R02

VALUE	DOCUMENT ID
0.2805±0.0029 OUR FIT Error includes scale factor of 1.3.	

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{total}$ — Γ_9/Γ

NODE=S014R53
NODE=S014R53

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
23.02±0.25 OUR FIT Error includes scale factor of 1.2.					
23.04±0.03±0.54	60k	[1] ABLIKIM	21AM	BES3	$J/\psi \to \gamma\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
22.60±0.35±0.29	3915	[2] LOPEZ	07	CLEO	$\psi(2S) \to J/\psi\eta$

[1] ABLIKIM 21AM normalize the branching ratio ($\eta \to \pi^+\pi^-\pi^0$) to B($J/\psi \to \gamma\eta$), which they measured absolutely. NODE=S014R53;LINKAGE=A

[2] Not independent of other results listed for LOPEZ 07. Assuming decays of $\eta \to \gamma\gamma$, $3\pi^0$, $\pi^+\pi^-\pi^0$, $\pi^+\pi^-\gamma$, and $e^+e^-\gamma$ account for all η decays within a contribution of 0.3% to the systematic error. NODE=S014R53;LINKAGE=LO

$\Gamma(\text{neutral modes})/\Gamma(\pi^+\pi^-\pi^0)$ $\Gamma_1/\Gamma_9 = (\Gamma_2+\Gamma_3+\Gamma_4)/\Gamma_9$

NODE=S014R8
NODE=S014R8

VALUE	EVTS	DOCUMENT ID		TECN
3.13±0.05 OUR FIT Error includes scale factor of 1.3.				
3.26±0.30 OUR AVERAGE				
2.54±1.89	74	KENDALL	74	OSPK
3.4 ±1.1	29	AGUILAR-...	72B	HBC
2.83±0.80	70	[1] BLOODWO...	72B	HBC
3.6 ±0.6	244	FLATTE	67B	HBC
2.89±0.56		ALFF-...	66	HBC
3.6 ±0.8	50	KRAEMER	64	DBC
3.8 ±1.1		PAULI	64	DBC

[1] Error increased from published value 0.5 by Bloodworth (private communication). NODE=S014R8;LINKAGE=B

$\Gamma(2\gamma)/\Gamma(\pi^+\pi^-\pi^0)$ Γ_2/Γ_9

NODE=S014R7
NODE=S014R7

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.710±0.025 OUR FIT Error includes scale factor of 1.2.					
1.70 ±0.04 OUR AVERAGE					
1.704±0.032±0.026	3915	[1] LOPEZ	07	CLEO	$\psi(2S) \to J/\psi\eta$
1.61 ±0.14		ABLIKIM	06E	BES2	$e^+e^- \to J/\psi \to \eta\gamma$
1.78 ±0.10 ±0.13	1077	AMSLER	95	CBAR	$\overline{p}p \to \pi^+\pi^-\eta$ at rest
1.72 ±0.25	401	BAGLIN	69	HLBC	
1.61 ±0.39		FOSTER	65	HBC	

[1] LOPEZ 07 reports $\Gamma(\eta \to \pi^+\pi^-\pi^0)$ / $\Gamma(\eta \to 2\gamma) = \Gamma_9/\Gamma_2 = 0.587 \pm 0.011 \pm 0.009$. NODE=S014R7;LINKAGE=LO

$\Gamma(3\pi^0)/\Gamma(\pi^+\pi^-\pi^0)$ Γ_3/Γ_9

NODE=S014R19
NODE=S014R19

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
1.415±0.023 OUR FIT Error includes scale factor of 1.2.					
1.48 ±0.05 OUR AVERAGE					
1.46 ±0.03 ±0.09		ACHASOV	06A	SND	$e^+e^- \to \eta\gamma$
1.52 ±0.04 ±0.08	23k	[1] AKHMETSHIN	01B	CMD2	$e^+e^- \to \phi \to \eta\gamma$
1.44 ±0.09 ±0.10	1627	AMSLER	95	CBAR	$\overline{p}p \to \pi^+\pi^-\eta$ at rest
1.50 $^{+0.15}_{-0.29}$	199	BAGLIN	69	HLBC	
1.47 $^{+0.20}_{-0.17}$		BULLOCK	68	HLBC	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.3 ±0.4		BAGLIN	67B	HLBC	
0.90 ±0.24		FOSTER	65	HBC	
2.0 ±1.0		FOELSCHE	64	HBC	
0.83 ±0.32		CRAWFORD	63	HBC	

[1] AKHMETSHIN 01B uses results from AKHMETSHIN 99F. NODE=S014R19;LINKAGE=KZ

$\Gamma(\pi^+\pi^-\pi^0)/[\Gamma(2\gamma)+\Gamma(3\pi^0)]$ $\Gamma_9/(\Gamma_2+\Gamma_3)$

NODE=S014R38
NODE=S014R38

VALUE	DOCUMENT ID		TECN	COMMENT
0.320 ±0.005 OUR FIT Error includes scale factor of 1.2.				
0.304 ±0.012	ACHASOV	00D	SND	$e^+e^- \to \phi \to \eta\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.3141±0.0081±0.0058	ACHASOV	00B	SND	See ACHASOV 00D

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

NODE=S014R54
NODE=S014R54

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
4.28±0.07 OUR FIT Error includes scale factor of 1.1.					
4.38±0.02±0.10	200k	[1] ABLIKIM	21AM	BES3	$J/\psi \to \gamma\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
3.96±0.14±0.14	859	[2] LOPEZ	07	CLEO	$\psi(2S) \to J/\psi\eta$

[1] ABLIKIM 21AM normalize the branching ratio ($\eta \to \pi^+\pi^-\gamma$) to B($J/\psi \to \gamma\eta$), which they measured absolutely. NODE=S014R54;LINKAGE=A

[2] Not independent of other results listed for LOPEZ 07. Assuming decays of $\eta \to \gamma\gamma$, $3\pi^0$, $\pi^+\pi^-\pi^0$, $\pi^+\pi^-\gamma$, and $e^+e^-\gamma$ account for all η decays within a contribution of 0.3% to the systematic error. NODE=S014R54;LINKAGE=LO

$\Gamma(\pi^+\pi^-\gamma)/\Gamma(\pi^+\pi^-\pi^0)$ — Γ_{10}/Γ_9

NODE=S014R4
NODE=S014R4

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.1858±0.0025 OUR FIT					
0.1847±0.0030 OUR AVERAGE Error includes scale factor of 1.1.					
0.1856±0.0005±0.0028	200k	BABUSCI	13	KLOE	$e^+e^- \to \phi \to \eta\gamma$
0.175 ±0.007 ±0.006	859	LOPEZ	07	CLEO	$\psi(2S) \to J/\psi\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.209 ±0.004	18k	THALER	73	ASPK	
0.201 ±0.006	7250	GORMLEY	70	ASPK	
0.28 ±0.04		BALTAY	67B	DBC	
0.25 ±0.035		LITCHFIELD	67	DBC	
0.30 ±0.06		CRAWFORD	66	HBC	
0.196 ±0.041		FOSTER	65C	HBC	

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

NODE=S014R40
NODE=S014R40

VALUE (units 10^{-3})	EVTS	DOCUMENT ID		TECN	COMMENT
7.00±0.22 OUR FIT Error includes scale factor of 1.1.					
6.96±0.22 OUR AVERAGE Error includes scale factor of 1.1.					
7.07±0.05±0.23	23k	ABLIKIM	24M	BES3	$e^+e^- \to J/\psi \to \gamma\eta/\eta'$
6.6 ±0.4 ±0.4	1345	BERGHAUSER	11	SPEC	$\gamma p \to p\eta$
7.8 ±0.5 ±0.8	435 ± 31	BERLOWSKI	08	WASA	$pd \to {}^3\text{He}\,\eta$
5.15±0.62±0.74	283	ACHASOV	01B	SND	$e^+e^- \to \phi \to \eta\gamma$
7.10±0.64±0.46	323	AKHMETSHIN	01	CMD2	$e^+e^- \to \phi \to \eta\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
9.4 ±0.7 ±0.5	172	[1] LOPEZ	07	CLEO	$\psi(2S) \to J/\psi\eta$

[1] Not independent of other results listed for LOPEZ 07. Assuming decays of $\eta \to \gamma\gamma$, $3\pi^0$, $\pi^+\pi^-\pi^0$, $\pi^+\pi^-\gamma$, and $e^+e^-\gamma$ account for all η decays within a contribution of 0.3% to the systematic error.

NODE=S014R40;LINKAGE=LO

$\Gamma(e^+e^-\gamma)/\Gamma(\pi^+\pi^-\gamma)$ — Γ_{11}/Γ_{10}

NODE=S014R51
NODE=S014R51

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.164±0.006 OUR FIT Error includes scale factor of 1.1.					
0.237±0.021±0.015	172	LOPEZ	07	CLEO	$\psi(2S) \to J/\psi\eta$

$\Gamma(e^+e^-\gamma)/\Gamma(\pi^+\pi^-\pi^0)$ — Γ_{11}/Γ_9

NODE=S014R28
NODE=S014R28

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
3.04±0.10 OUR FIT Error includes scale factor of 1.1.					
2.1 ±0.5	80	JANE	75B	OSPK	See the erratum

$\Gamma(\text{neutral modes})/\left[\Gamma(\pi^+\pi^-\pi^0)+\Gamma(\pi^+\pi^-\gamma)+\Gamma(e^+e^-\gamma)\right]$ — $\Gamma_1/(\Gamma_9+\Gamma_{10}+\Gamma_{11}) = (\Gamma_2+\Gamma_3+\Gamma_4)/(\Gamma_9+\Gamma_{10}+\Gamma_{11})$

NODE=S014R1
NODE=S014R1

VALUE	EVTS	DOCUMENT ID		TECN
2.57±0.04 OUR FIT Error includes scale factor of 1.3.				
2.64±0.23		BALTAY	67B	DBC
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.5 ±1.0	280	[1] JAMES	66	HBC
3.20±1.26	53	[1] BASTIEN	62	HBC
2.5 ±1.0	10	[1] PICKUP	62	HBC

[1] These experiments are not used in the averages as they do not separate clearly $\eta \to \pi^+\pi^-\pi^0$ and $\eta \to \pi^+\pi^-\gamma$ from each other. The reported values thus probably contain some unknown fraction of $\eta \to \pi^+\pi^-\gamma$.

NODE=S014R1;LINKAGE=N

$\Gamma(2\gamma)/\left[\Gamma(\pi^+\pi^-\pi^0)+\Gamma(\pi^+\pi^-\gamma)+\Gamma(e^+e^-\gamma)\right]$ — $\Gamma_2/(\Gamma_9+\Gamma_{10}+\Gamma_{11})$

NODE=S014R2
NODE=S014R2

VALUE	EVTS	DOCUMENT ID		TECN
1.406±0.020 OUR FIT Error includes scale factor of 1.2.				
1.1 ±0.4 OUR AVERAGE				
1.51 ±0.93	75	KENDALL	74	OSPK
0.99 ±0.48		CRAWFORD	63	HBC

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

NODE=S014R30
NODE=S014R30

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
3.1±0.4 OUR FIT					
3.1±0.4	600	DZHELYADIN	80	SPEC	$\pi^- p \to \eta n$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.5±0.75	100	BUSHNIN	78	SPEC	See DZHELYADIN 80

$\Gamma(e^+e^-)/\Gamma_{total}$ Γ_{13}/Γ NODE=S014R29

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<7 × 10^{-7}	90	ACHASOV	18B	CNTR	Inverse reaction $e^+e^- \to \eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<2.3 \times 10^{-6}$	90	AGAKISHIEV	14		$pp \to \eta + X$
$<5.6 \times 10^{-6}$	90	[1] AGAKISHIEV	12A	SPEC	$pp \to \eta + X$
$<2.7 \times 10^{-5}$	90	BERLOWSKI	08	WASA	$pd \to {}^3\text{He}\,\eta$
$<0.77 \times 10^{-4}$	90	BROWDER	97B	CLE2	$e^+e^- \simeq$ 10.5 GeV
$<2 \times 10^{-4}$	90	WHITE	96	SPEC	$pd \to \eta\,{}^3\text{He}$
$<3 \times 10^{-4}$	90	DAVIES	74	RVUE	Uses ESTEN 67

[1] AGAKISHIEV 12A uses a data sample of 3.5 GeV proton beam collisions on liquid hydrogen target collected by the HADES detector. NODE=S014R29;LINKAGE=AG

$\Gamma(\mu^+\mu^-)/\Gamma_{total}$ Γ_{14}/Γ NODE=S014R23

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
5.8±0.8 OUR AVERAGE						
$5.7\pm0.7\pm0.5$		114	ABEGG	94	SPEC	$pd \to \eta\,{}^3\text{He}$
6.5 ± 2.1		27	DZHELYADIN	80B	SPEC	$\pi^- p \to \eta n$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$5.6^{+0.6}_{-0.7}\pm0.5$		100	KESSLER	93	SPEC	See ABEGG 94
<20	95	0	WEHMANN	68	OSPK	

$\Gamma(\mu^+\mu^-)/\Gamma(2\gamma)$ Γ_{14}/Γ_2 NODE=S014R25

VALUE (units 10^{-5})	DOCUMENT ID		TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •			
5.9 ± 2.2	HYAMS	69	OSPK

$\Gamma(2e^+2e^-)/\Gamma_{total}$ Γ_{15}/Γ NODE=S014R41

VALUE (units 10^{-5})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
2.4±0.2±0.1		362	[1] AMBROSINO	11B	KLOE	$e^+e^- \to \phi \to \eta\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<9.7	90		BERLOWSKI	08	WASA	$pd \to {}^3\text{He}\,\eta$
<6.9	90		AKHMETSHIN	01	CMD2	$e^+e^- \to \phi \to \eta\gamma$

[1] This measurement is fully inclusive (includes "$2e^+2e^-\gamma$" channel). NODE=S014R41;LINKAGE=AM

$\Gamma(\pi^+\pi^-e^+e^-(\gamma))/\Gamma_{total}$ Γ_{16}/Γ NODE=S014R10

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
2.68±0.11 OUR FIT					
2.68±0.09±0.07	1555 ± 52	[1] AMBROSINO	09B	KLOE	$e^+e^- \to \phi \to \eta\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$4.3\ ^{+2.0}_{-1.6}\ \pm0.4$	16	BERLOWSKI	08	WASA	$pd \to {}^3\text{He}\,\eta$
$4.3\ \pm1.3\ \pm0.4$	16	BARGHOLTZ	07	CNTR	See BERLOWSKI 08
$3.7\ ^{+2.5}_{-1.8}\ \pm0.3$	4	AKHMETSHIN	01	CMD2	$e^+e^- \to \phi \to \eta\gamma$

[1] This AMBROSINO 09B value includes radiative events. NODE=S014R10;LINKAGE=AM

$\Gamma(e^+e^-\mu^+\mu^-)/\Gamma_{total}$ Γ_{17}/Γ NODE=S014R55

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<1.6 × 10^{-4}	90	BERLOWSKI	08	WASA	$pd \to {}^3\text{He}\,\eta$

$\Gamma(2\mu^+2\mu^-)/\Gamma(\mu^+\mu^-)$ Γ_{18}/Γ_{14} NODE=S014R00

VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
8.6±1.4±1.2	49.6	HAYRAPETY...	23A	CMS	pp at 13 TeV

$\Gamma(\mu^+\mu^-\pi^+\pi^-)/\Gamma_{total}$ Γ_{19}/Γ NODE=S014R57

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<3.6 × 10^{-4}	90	BERLOWSKI	08	WASA	$pd \to {}^3\text{He}\,\eta$

$\Gamma(\pi^+e^-\overline{\nu}_e+\text{c.c.})/\Gamma(\pi^+\pi^-\pi^0)$ Γ_{20}/Γ_9 NODE=S014R58

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<7.3 × 10^{-4}	90	ABLIKIM	13G	BES3	$J/\psi \to \phi\eta$

$\Gamma(\pi^+\pi^-2\gamma)/\Gamma(\pi^+\pi^-\pi^0)$ — Γ_{21}/Γ_9

NODE=S014R18
NODE=S014R18

VALUE	CL%	DOCUMENT ID		TECN
< 9 × 10^{-3}		PRICE	67	HBC
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<16 × 10^{-3}	95	BALTAY	67B	DBC

$\Gamma(\pi^+\pi^-\pi^0\gamma)/\Gamma(\pi^+\pi^-\pi^0)$ — Γ_{22}/Γ_9

NODE=S014R17
NODE=S014R17

VALUE	CL%	EVTS	DOCUMENT ID		TECN
<0.24 × 10^{-2}	90	0	THALER	73	ASPK
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<1.7 × 10^{-2}	90		ARNOLD	68	HLBC
<1.6 × 10^{-2}	95		BALTAY	67B	DBC
<7.0 × 10^{-2}			FLATTE	67	HBC
<0.9 × 10^{-2}			PRICE	67	HBC

$\Gamma(\pi^0\mu^+\mu^-\gamma)/\Gamma_{total}$ — Γ_{23}/Γ

NODE=S014R31
NODE=S014R31

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<3 × 10^{-6}	90	DZHELYADIN	81	SPEC	$\pi^- p \to \eta n$

Forbidden modes

NODE=S014320

$\Gamma(\pi^0\gamma)/\Gamma_{total}$ — Γ_{24}/Γ

NODE=S014R16

Forbidden by angular momentum conservation.

NODE=S014R16
NODE=S014R16

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<9 × 10^{-5}	90	NEFKENS	05A	CRYB	p(720 MeV/c) $\pi^- \to n\eta$

$\Gamma(\pi^+\pi^-)/\Gamma_{total}$ — Γ_{25}/Γ

NODE=S014R27

Forbidden by P and CP invariance.

NODE=S014R27
NODE=S014R27

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
< 4.4 × 10^{-6}	90	83M	[1] BABUSCI	20A	KLOE	$e^+e^- \to \phi \to \eta\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
< 5.3 × 10^{-17}			[2] ZHEVLAKOV	19	THEO	from nEDM limits
< 1.6 × 10^{-5}	90	25M	AAIJ	17D	LHCB	in $D \to \pi\pi\pi$ decays
< 3.9 × 10^{-4}	90	225M	ABLIKIM	11G	BES3	$e^+e^- \to J/\psi \to \eta\gamma$
< 1.3 × 10^{-5}	90	16M	AMBROSINO	05A	KLOE	$e^+e^- \to \phi \to \eta\gamma$
< 3.3 × 10^{-4}	90		AKHMETSHIN	99B	CMD2	$e^+e^- \to \phi \to \eta\gamma$
< 9 × 10^{-4}	90		AKHMETSHIN	97C	CMD2	See AKHMETSHIN 99B
<15 × 10^{-4}		0	THALER	73	ASPK	

[1] BABUSCI 20A combines new data with the previous AMBROSINO 05A data, and thus supersedes AMBROSINO 05A. NODE=S014R27;LINKAGE=B

[2] ZHEVLAKOV 19 derives the value from the experimental limits of nEDM by a calculation using an effective Lagrangian. NODE=S014R27;LINKAGE=A

$\Gamma(2\pi^0)/\Gamma_{total}$ — Γ_{26}/Γ

NODE=S014R37

Forbidden by P and CP invariance.

NODE=S014R37
NODE=S014R37

VALUE	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
<3.5 × 10^{-4}	90		BLIK	07	GAM4	$\pi^- p \to \eta n$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<2.7 × 10^{-17}			[1] ZHEVLAKOV	19	THEO	from nEDM limits
<6.9 × 10^{-4}	90	225M	ABLIKIM	11G	BES3	$e^+e^- \to J/\psi \to \eta\gamma$
<4.3 × 10^{-4}	90		AKHMETSHIN	99C	CMD2	$e^+e^- \to \phi \to \eta\gamma$
<6 × 10^{-4}	90		[2] ACHASOV	98	SND	$e^+e^- \to \phi \to \eta\gamma$

[1] ZHEVLAKOV 19 derives the value from the experimental limits of nEDM by a calculation using an effective Lagrangian. NODE=S014R37;LINKAGE=B

[2] ACHASOV 98 observes one event in a $\pm3\sigma$ region around the η mass, while a Monte Carlo calculation gives 10 $\pm$ 5 events. The limit here is the Poisson upper limit for one observed event and no background. NODE=S014R37;LINKAGE=A

$\Gamma(2\pi^0\gamma)/\Gamma_{total}$ — Γ_{27}/Γ

NODE=S014R20

Forbidden by C invariance.

NODE=S014R20
NODE=S014R20

VALUE	CL%	DOCUMENT ID		TECN	CHG	COMMENT
< 5 × 10^{-4}	90	NEFKENS	05	CRYB	0	p(720 MeV/c) $\pi^- \to n\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
<17 × 10^{-4}	90	BLIK	07	GAM4		$\pi^- p \to \eta n$

$\Gamma(3\pi^0\gamma)/\Gamma_{total}$ — Γ_{28}/Γ

NODE=S014R48

Forbidden by C invariance.

VALUE	CL%	DOCUMENT ID		TECN	CHG	COMMENT
$< 6 \times 10^{-5}$	90	NEFKENS	05	CRYB	0	p(720 MeV/c) $\pi^- \to n\eta$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$<24 \times 10^{-5}$	90	BLIK	07	GAM4		$\pi^- p \to \eta n$

$\Gamma(3\gamma)/\Gamma_{total}$ — Γ_{29}/Γ

NODE=S014R46

Forbidden by C invariance.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<16 \times 10^{-5}$	90	BLIK	07	GAM4	$\pi^- p \to \eta n$
$< 4 \times 10^{-5}$	90	NEFKENS	05A	CRYB	p(720 MeV/c) $\pi^- \to n\eta$

$\Gamma(3\gamma)/\Gamma(2\gamma)$ — Γ_{29}/Γ_2

NODE=S014R44

VALUE	CL%	DOCUMENT ID		TECN	CHG
$<1.2 \times 10^{-3}$	95	ALDE	84	GAM2	0

$\Gamma(3\gamma)/\Gamma(3\pi^0)$ — Γ_{29}/Γ_3

NODE=S014R45

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<4.9 \times 10^{-5}$	90	ALOISIO	04	KLOE	$\phi \to \eta\gamma$

$\Gamma(4\pi^0)/\Gamma_{total}$ — Γ_{30}/Γ

NODE=S014R39

Forbidden by P and CP invariance.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 6.9 \times 10^{-7}$	90	PRAKHOV	00	CRYB	$\pi^- p \to n\eta$, 720 MeV/c
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<200 \times 10^{-7}$	90	BLIK	07	GAM4	$\pi^- p \to \eta n$

$\Gamma(\pi^0 e^+ e^-)/\Gamma_{total}$ — Γ_{31}/Γ

NODE=S014R15

C parity forbids this to occur as a single-photon process.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$< 7.5 \times 10^{-6}$	90	ADLARSON	18C	WASA	$p d \to \eta\, ^3$He
$< 1.6 \times 10^{-4}$	90	MARTYNOV	76	HLBC	
$< 8.4 \times 10^{-4}$	90	BAZIN	68	DBC	
$<70 \times 10^{-4}$		RITTENBERG	65	HBC	

$\Gamma(\pi^0 e^+ e^-)/\Gamma(\pi^+\pi^-\pi^0)$ — Γ_{31}/Γ_9

NODE=S014R9

C parity forbids this to occur as a single-photon process.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 3.28 \times 10^{-5}$	90	ADLARSON	18C	WASA	$p d \to \eta\, ^3$He
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$< 1.9 \times 10^{-4}$	90	JANE	75	OSPK	
$< 42 \times 10^{-4}$	90	BAGLIN	67	HLBC	
$< 16 \times 10^{-4}$	90	BILLING	67	HLBC	
$< 77 \times 10^{-4}$		FOSTER	65B	HBC	
$<110 \times 10^{-4}$		PRICE	65	HBC	

$\Gamma(\pi^0 \mu^+ \mu^-)/\Gamma_{total}$ — Γ_{32}/Γ

NODE=S014R24

C parity forbids this to occur as a single-photon process.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 5 \times 10^{-6}$	90	DZHELYADIN	81	SPEC	$\pi^- p \to \eta n$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<500 \times 10^{-6}$		WEHMANN	68	OSPK	

$[\Gamma(\mu^+ e^-) + \Gamma(\mu^- e^+)]/\Gamma_{total}$ — Γ_{33}/Γ

NODE=S014R36

Forbidden by lepton family number conservation.

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<6 \times 10^{-6}$	90	WHITE	96	SPEC	$p d \to \eta\, ^3$He

η *C*-NONCONSERVING DECAY PARAMETERS

NODE=S014230

$\pi^+ \pi^- \pi^0$ LEFT-RIGHT ASYMMETRY PARAMETER

NODE=S014A1

Measurements with an error $> 1.0 \times 10^{-2}$ have been omitted.

NODE=S014A1
NODE=S014A1

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*
$0.09^{+0.11}_{-0.12}$ OUR AVERAGE				
$+0.09 \pm 0.10 ^{+0.09}_{-0.14}$	1.34M	AMBROSINO	08D	KLOE
0.28 ± 0.26	165k	JANE	74	OSPK
-0.05 ± 0.22	220k	LAYTER	72	ASPK
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.5 ± 0.5	37k	[1] GORMLEY	68C	ASPK

[1] The GORMLEY 68C asymmetry is probably due to unmeasured ($\mathbf{E} \times \mathbf{B}$) spark chamber effects. New experiments with ($\mathbf{E} \times \mathbf{B}$) controls don't observe an asymmetry.

NODE=S014A1;LINKAGE=G

$\pi^+ \pi^- \pi^0$ SEXTANT ASYMMETRY PARAMETER

NODE=S014AS

Measurements with an error $> 2.0 \times 10^{-2}$ have been omitted.

NODE=S014AS
NODE=S014AS

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*
$0.12^{+0.10}_{-0.11}$ OUR AVERAGE				
$+0.08 \pm 0.10 ^{+0.08}_{-0.13}$	1.34M	AMBROSINO	08D	KLOE
0.20 ± 0.25	165k	JANE	74	OSPK
0.10 ± 0.22	220k	LAYTER	72	ASPK
0.5 ± 0.5	37k	GORMLEY	68C	WIRE

$\pi^+ \pi^- \pi^0$ QUADRANT ASYMMETRY PARAMETER

NODE=S014AQ
NODE=S014AQ

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*
-0.09 ± 0.09 OUR AVERAGE				
$-0.05 \pm 0.10 ^{+0.03}_{-0.05}$	1.34M	AMBROSINO	08D	KLOE
-0.30 ± 0.25	165k	JANE	74	OSPK
-0.07 ± 0.22	220k	LAYTER	72	ASPK

$\pi^+ \pi^- \gamma$ LEFT-RIGHT ASYMMETRY PARAMETER

NODE=S014A2

Measurements with an error $> 2.0 \times 10^{-2}$ have been omitted.

NODE=S014A2
NODE=S014A2

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*
0.9 ± 0.4 OUR AVERAGE				
1.2 ± 0.6	35k	JANE	74B	OSPK
0.5 ± 0.6	36k	THALER	72	ASPK
1.22 ± 1.56	7257	GORMLEY	70	ASPK

$\pi^+ \pi^- \gamma$ PARAMETER β (*D*-wave)

NODE=S014BET

Sensitive to a *D*-wave contribution: $dN/d\cos\theta = \sin^2\theta \ (1 + \beta \ \cos^2\theta)$.

NODE=S014BET
NODE=S014BET

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*
-0.02 ± 0.07 OUR AVERAGE Error includes scale factor of 1.3.				
0.11 ± 0.11	35k	JANE	74B	OSPK
-0.060 ± 0.065	7250	GORMLEY	70	WIRE
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.12 ± 0.06		[1] THALER	72	ASPK

[1] The authors don't believe this indicates *D*-wave because the dependence of β on the γ energy is inconsistent with the theoretical prediction. A $\cos^2\theta$ dependence can also come from *P*- and *F*-wave interference.

NODE=S014BET;LINKAGE=L

η *CP*-NONCONSERVING DECAY PARAMETER

NODE=S014240

$\pi^+ \pi^- e^+ e^-$ DECAY-PLANE ASYMMETRY PARAMETER A_ϕ

NODE=S014AET

In the η rest frame, the total momentum of the $e^+ e^-$ pair is equal and opposite to that of the $\pi^+ \pi^-$ pair. Let $\hat{z}$ be the unit vector along the momentum of the $e^+ e^-$ pair; let $\hat{n}_{ee}$ and $\hat{n}_{\pi\pi}$ be the unit vectors normal to the $e^+ e^-$ and $\pi^+ \pi^-$ planes; and let ϕ be the angle between the two normals. Then

NODE=S014AET

$$\sin\phi \ \cos\phi = [(\hat{n}_{ee} \times \hat{n}_{\pi\pi}) \cdot \hat{z}] \ (\hat{n}_{ee} \cdot \hat{n}_{\pi\pi}) \ ,$$

and

$$A_\phi \ \equiv \ \frac{N_{\sin\phi \ \cos\phi > 0} - N_{\sin\phi \ \cos\phi < 0}}{N_{\sin\phi \ \cos\phi > 0} + N_{\sin\phi \ \cos\phi < 0}} \ .$$

NODE=S014AET

VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
$-0.6 \pm 2.5 \pm 1.8$	1555 ± 52	AMBROSINO	09B	KLOE	$e^+ e^- \to \ \phi \to \ \eta\gamma$

ENERGY DEPENDENCE OF $\eta \to 3\pi$ DALITZ PLOTS

NODE=S014235

PARAMETERS FOR $\eta \to \pi^+\pi^-\pi^0$

NODE=S014DP

See the "Note on η Decay Parameters," page 1454, in our 1994 edition (Physical Review **D50** 1173 (1994)). The following experiments fit to one or more of the coefficients a, b, c, d, e, f or g for $|\text{matrix element}|^2 = 1 + ay + by^2 + cx + dx^2 + exy + fy^3 + gx^2y$.

NODE=S014DP

NODE=S014DP

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
	631k	[1] ABLIKIM	23AN	BES3	$J/\psi \to \gamma\eta$
	4.7M	[2] ANASTASI	16A	KLOE	$e^+e^- \to \phi \to \eta\gamma$
	79k	ABLIKIM	15G	BES3	$e^+e^- \to J/\psi \to \gamma\eta$
	174k	ADLARSON	14A	WASA	$pd \to \eta\, ^3\text{He}$
	1.34M	AMBROSINO	08D	KLOE	
	3230	[3] ABELE	98D	CBAR	$\overline{p}p \to \pi^0\pi^0\eta$ at rest
	1077	[4] AMSLER	95	CBAR	$\overline{p}p \to \pi^+\pi^-\eta$ at rest
	81k	LAYTER	73	ASPK	
	220k	LAYTER	72	ASPK	
	1138	CARPENTER	70	HBC	
	349	DANBURG	70	DBC	
	7250	GORMLEY	70	WIRE	
	526	BAGLIN	69	HLBC	
	7170	CNOPS	68	OSPK	
	37k	GORMLEY	68C	WIRE	
	1300	CLPWY	66	HBC	
	705	LARRIBE	66	HBC	

[1] ABLIKIM 23AN fit the Dalitz plot density distribution with two parameter sets (a, b, d, f), and (a, b, d, f, g). NODE=S014DP;LINKAGE=D

[2] ANASTASI 16A measure the Dalitz parameters a, b, d, f, and g. This is the first measurement of g. NODE=S014DP;LINKAGE=C

[3] ABELE 98D obtains $a = -1.22 \pm 0.07$ and $b = 0.22 \pm 0.11$ when c (or d) is fixed at 0.06. NODE=S014DP;LINKAGE=B

[4] AMSLER 95 fits to $(1+ay+by^2)$ and obtains $a=-0.94 \pm 0.15$ and $b=0.11 \pm 0.27$. NODE=S014DP;LINKAGE=A

α PARAMETER FOR $\eta \to 3\pi^0$

NODE=S014A0

See the "Note on η Decay Parameters" in our 1994 edition, Phys. Rev. **D50**, 1 August 1994, Part I, p. 1454. The value here is of α in $|\text{matrix element}|^2 = 1 + 2\alpha z$.

NODE=S014A0

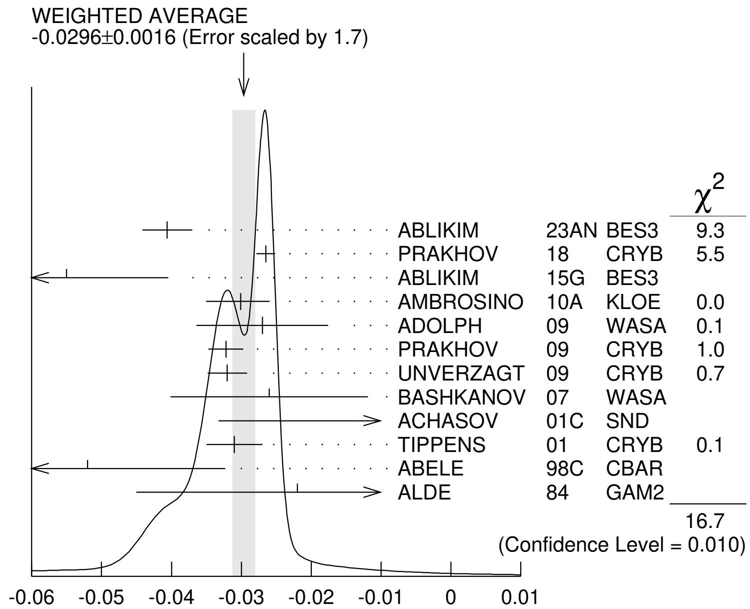
NODE=S014A0

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
−0.0296±0.0016 OUR AVERAGE		Error includes scale factor of 1.7. See the ideogram below.			
−0.0406±0.0035±0.0008	272k	ABLIKIM	23AN	BES3	$J/\psi \to \gamma\eta$
−0.0265±0.0010±0.0009	7M	PRAKHOV	18	CRYB	$\gamma p \to p\eta$
−0.055 ±0.014 ±0.004	33k	ABLIKIM	15G	BES3	$e^+e^- \to J/\psi \to \gamma\eta$
$-0.0301\pm0.0035{}^{+0.0022}_{-0.0035}$	512k	AMBROSINO	10A	KLOE	$e^+e^- \to \phi \to \eta\gamma$
−0.027 ±0.008 ±0.005	120k	[1] ADOLPH	09	WASA	$pp \to pp\eta$
−0.0322±0.0012±0.0022	3M	[2] PRAKHOV	09	CRYB	$\gamma p \to p\eta$
−0.032 ±0.002 ±0.002	1.8M	[2] UNVERZAGT	09	CRYB	$\gamma p \to p\eta$
−0.026 ±0.010 ±0.010	75k	BASHKANOV	07	WASA	$pp \to pp\eta$
−0.010 ±0.021 ±0.010	12k	ACHASOV	01C	SND	$e^+e^- \to \phi \to \eta\gamma$
−0.031 ±0.004	1M	TIPPENS	01	CRYB	$\pi^- p \to n\eta$, 720 MeV
−0.052 ±0.017 ±0.010	98k	ABELE	98C	CBAR	$\overline{p}p \to 5\pi^0$
−0.022 ±0.023	50k	ALDE	84	GAM2	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$-0.038\pm0.003{}^{+0.012}_{-0.008}$	1.34M	[3] AMBROSINO	08D	KLOE	
−0.32 ±0.37	192	BAGLIN	70	HLBC	

[1] This ADOLPH 09 result is independent of the BASHKANOV 07 result. NODE=S014A0;LINKAGE=AD

[2] The PRAKHOV 09 and UNVERZAGT 09 results are independent. NODE=S014A0;LINKAGE=PU

[3] This AMBROSINO 08D value is an indirect result using $\eta \to \pi^+\pi^0\pi^-$ events and a rescattering matrix that mixes isospin decay amplitudes. NODE=S014A0;LINKAGE=AM



α PARAMETER FOR $\eta \to 3\pi^0$

PARAMETER Λ IN $\eta \to \ell^+\ell^-\gamma$ DECAY

NODE=S014LAM

In the pole approximation the electromagnetic transition form factor for a resonance of mass M is given by the expression:

NODE=S014LAM

$$|F|^2 = (1 - M^2_{\ell\ell}/\Lambda^2)^{-2},$$

where for the parameter Λ vector dominance predicts $\Lambda \approx 0.770$ GeV.

NODE=S014LAM

VALUE (GeV/c^2)	EVTS	DOCUMENT ID		TECN	COMMENT
0.721 ±0.011 OUR AVERAGE					
0.749 ±0.027 ±0.008	23k	ABLIKIM	24M	BES3	$e^+e^- \to J/\psi \to \gamma\eta/\eta'$
0.712 ±0.020		[1] ADLARSON	17B	A2MM	$\gamma p \to \eta p$
0.7191±0.0125±0.0093		[2] ARNALDI	16	NA60	400 GeV p-A collisions
0.716 ±0.031 ±0.009		[3] ARNALDI	09	NA60	158A In−In collisions
0.72 ±0.09	600	DZHELYADIN	80	SPEC	$\pi^- p \to \eta n$, $\eta \to \gamma\mu^+\mu^-$

[1] ADLARSON 17B reports $\Lambda^{-2}(\eta \to \gamma e^+e^-) = 1.97 \pm 0.11$ (GeV/c^2)$^{-2}$ which we converted to the quoted Λ value and uncertainty (total=statistical plus systematic).

NODE=S014LAM;LINKAGE=C

[2] ARNALDI 16 reports $\Lambda^{-2}(\eta \to \gamma\mu^+\mu^-) = 1.934 \pm 0.067 \pm 0.050$ (GeV/c^2)$^{-2}$ which we converted to the quoted Λ value.

NODE=S014LAM;LINKAGE=A

[3] ARNALDI 09 reports $\Lambda^{-2}(\eta \to \gamma\mu^+\mu^-) = 1.95 \pm 0.17 \pm 0.05$ (GeV/c^2)$^{-2}$ which we converted to the quoted Λ value.

NODE=S014LAM;LINKAGE=B

η REFERENCES

NODE=S014

ABLIKIM	24M	PR D109 072001	M. Ablikim *et al.*	(BESIII Collab.)	REFID=62663
ANDREEV	24D	PRL 133 121803	Yu.M. Andreev *et al.*	(NA64 Collab.)	REFID=63013
ABLIKIM	23AN	PR D107 092007	M. Ablikim *et al.*	(BESIII Collab.)	REFID=62273
HAYRAPETY...	23A	PRL 131 091903	A. Hayrapetyan *et al.*	(CMS Collab.)	REFID=62405
ABLIKIM	21AM	PR D104 092004	M. Ablikim *et al.*	(BESIII Collab.)	REFID=61445
BABUSCI	20A	JHEP 2010 047	D. Babusci *et al.*	(KLOE-2 Collab.)	REFID=60758
ZHEVLAKOV	19	PR D99 031703	A.S. Zhevlakov *et al.*	(TMSK, MAINZ, TUBIN+)	REFID=59827
ACHASOV	18B	PR D98 052007	M.N. Achasov *et al.*	(SND Collab.)	REFID=59440
ADLARSON	18C	PL B784 378	P. Adlarson *et al.*	(WASA-at-COSY Collab.)	REFID=59401
PRAKHOV	18	PR C97 065203	S. Prakhov *et al.*	(A2 Collab. at MAMI)	REFID=59050
AAIJ	17D	PL B764 233	R. Aaij *et al.*	(LHCb Collab.)	REFID=57702
ADLARSON	17B	PR C95 035208	P. Adlarson *et al.*	(A2 Collab. at MAMI)	REFID=58155
ANASTASI	16A	JHEP 1605 019	A. Anastasi *et al.*	(KLOE-2 Collab.)	REFID=57330
ARNALDI	16	PL B757 437	R. Arnaldi *et al.*	(NA60 Collab.)	REFID=57220
ABLIKIM	15G	PR D92 012014	M. Ablikim *et al.*	(BESIII Collab.)	REFID=56602
ADLARSON	14A	PR C90 045207	P. Adlarson *et al.*	(WASA-at-COSY Collab.)	REFID=56191
AGAKISHIEV	14	PL B731 265	G. Agakishiev *et al.*	(HADES Collab.)	REFID=55770
NEFKENS	14	PR C90 025206	B.M.K. Nefkens *et al.*	(A2 Collab. at MAMI)	REFID=55781
NIKOLAEV	14	EPJ A50 58	A. Nikolaev *et al.*	(MAMI-B, MAINZ, BONN)	REFID=55699
ABLIKIM	13	PR D87 012009	M. Ablikim *et al.*	(BESIII Collab.)	REFID=54829
ABLIKIM	13G	PR D87 032006	M. Ablikim *et al.*	(BESIII Collab.)	REFID=54952
BABUSCI	13	PL B718 910	D. Babusci *et al.*	(KLOE/KLOE-2 Collab.)	REFID=54812
BABUSCI	13A	JHEP 1301 119	D. Babusci *et al.*	(KLOE-2 Collab.)	REFID=54898
AGAKISHIEV	12A	EPJ A48 64	G. Agakishiev *et al.*	(HADES Collab.)	REFID=54119
GOSLAWSKI	12	PR D85 112011	P. Goslawski *et al.*	(COSY-ANKE Collab.)	REFID=54411
ABLIKIM	11G	PR D84 032006	M. Ablikim *et al.*	(BESIII Collab.)	REFID=53711
AMBROSINO	11B	PL B702 324	F. Ambrosino *et al.*	(KLOE Collab.)	REFID=16685
BERGHAUSER	11	PL B701 562	H. Berghauser *et al.*	(GIES, UCLA, GUTE)	REFID=16703
AMBROSINO	10A	PL B694 16	F. Ambrosino *et al.*	(KLOE Collab.)	REFID=53487

ADOLPH	09	PL B677 24	C. Adolph *et al.*	(WASA-at-COSY Collab.)	REFID=52832
AMBROSINO	09B	PL B675 283	F. Ambrosino *et al.*	(KLOE Collab.)	REFID=52836
ARNALDI	09	PL B677 260	R. Arnaldi *et al.*	(NA60 Collab.)	REFID=52720
PRAKHOV	09	PR C79 035204	S. Prakhov *et al.*	(MAMI-C Crystal Ball Collab.)	REFID=52786
UNVERZAGT	09	EPJ A39 169	M. Unverzagt *et al.*	(MAMI-B Crystal Ball Collab.)	REFID=52845
AMBROSINO	08D	JHEP 0805 006	F. Ambrosino *et al.*	(DAPHNE KLOE Collab.)	REFID=52323
BERLOWSKI	08	PR D77 032004	M. Berlowski *et al.*	(CELSIUS/WASA Collab.)	REFID=52504
PRAKHOV	08	PR C78 015206	S. Prakhov *et al.*	(BNL Crystal Ball Collab.)	REFID=52333
RODRIGUES	08	PRL 101 012301	T.E. Rodrigues *et al.*	(USP, FESP, UNESP+)	REFID=52444
AMBROSINO	07B	JHEP 0712 073	F. Ambrosino *et al.*	(KLOE Collab.)	REFID=52111
BARGHOLTZ	07	PL B644 299	Chr. Bargholtz *et al.*	(CELSIUS/WASA Collab.)	REFID=51597
BASHKANOV	07	PR C76 048201	M. Bashkanov *et al.*	(CELSIUS/WASA Collab.)	REFID=51966
BLIK	07	PAN 70 693 Translated from YAF 70 724.	A.M. Blik *et al.*	(GAMS Collab.)	REFID=51829
LOPEZ	07	PRL 99 122001	A. Lopez *et al.*	(CLEO Collab.)	REFID=51923
MILLER	07	PRL 99 122002	D.H. Miller *et al.*	(CLEO Collab.)	REFID=51924
ABLIKIM	06E	PR D73 052008	M. Ablikim *et al.*	(BES Collab.)	REFID=51057
ABLIKIM	06Q	PRL 97 202002	M. Ablikim *et al.*	(BES Collab.)	REFID=51487
ACHASOV	06A	PR D74 014016	M.N. Achasov *et al.*	(SND Collab.)	REFID=51133
ABDEL-BARY	05	PL B619 281	M. Abdel-Bary *et al.*	(GEM Collab.)	REFID=50656
AKHMETSHIN	05	PL B605 26	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)	REFID=50330
AMBROSINO	05A	PL B606 276	F. Ambrosino *et al.*	(KLOE Collab.)	REFID=50467
NEFKENS	05	PRL 94 041601	B.M.K. Nefkens *et al.*	(BNL Crystal Ball Collab.)	REFID=50487
NEFKENS	05A	PR C72 035212	B.M.K. Nefkens *et al.*	(BNL Crystal Ball Collab.)	REFID=50857
PRAKHOV	05	PR C72 025201	S. Prakhov *et al.*	(BNL Crystal Ball Collab.)	REFID=50854
ALOISIO	04	PL B591 49	A. Aloisio *et al.*	(KLOE Collab.)	REFID=49913
KNECHT	04	PL B589 14	N. Knecht *et al.*		REFID=49901
LAI	02	PL B533 196	A. Lai *et al.*	(CERN NA48 Collab.)	REFID=48724
NEFKENS	02	PS T99 114	B.M.K. Nefkens, J.W. Price	(UCLA)	REFID=49693
ACHASOV	01B	PL B504 275	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)	REFID=48111
ACHASOV	01C	JETPL 73 451 Translated from ZETFP 73 511.	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)	REFID=48201
ACHASOV	01D	NP B600 3	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)	REFID=48202
AKHMETSHIN	01	PL B501 191	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)	REFID=48110
AKHMETSHIN	01B	PL B509 217	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)	REFID=48167
TIPPENS	01	PRL 87 192001	W.B. Tippens *et al.*	(BNL Crystal Ball Collab.)	REFID=48431
ACHASOV	00	EPJ C12 25	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)	REFID=47417
ACHASOV	00B	JETP 90 17 Translated from ZETF 117 22.	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)	REFID=47425
ACHASOV	00D	JETPL 72 282 Translated from ZETFP 72 411.	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)	REFID=47882
PRAKHOV	00	PRL 84 4802	S. Prakhov *et al.*	(BNL Crystal Ball Collab.)	REFID=47627
AKHMETSHIN	99B	PL B462 371	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)	REFID=47392
AKHMETSHIN	99C	PL B462 380	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)	REFID=47393
AKHMETSHIN	99F	PL B460 242	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)	REFID=47473
ABELE	98C	PL B417 193	A. Abele *et al.*	(Crystal Barrel Collab.)	REFID=45896
ABELE	98D	PL B417 197	A. Abele *et al.*	(Crystal Barrel Collab.)	REFID=45897
ACHASOV	98	PL B425 388	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)	REFID=46083
AKHMETSHIN	97C	PL B415 452	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)	REFID=45802
BROWDER	97B	PR D56 5359	T.E. Browder *et al.*	(CLEO Collab.)	REFID=45678
ABEGG	96	PR D53 11	R. Abegg *et al.*	(Saturne SPES2 Collab.)	REFID=44636
WHITE	96	PR D53 6658	D.B. White *et al.*	(Saturne SPES2 Collab.)	REFID=44790
AMSLER	95	PL B346 203	C. Amsler *et al.*	(Crystal Barrel Collab.)	REFID=44135
KRUSCHE	95D	ZPHY A351 237	B. Krusche *et al.*	(TAPS + A2 Collab.)	REFID=44951
ABEGG	94	PR D50 92	R. Abegg *et al.*	(Saturne SPES2 Collab.)	REFID=43864
PDG	94	PR D50 1173	L. Montanet *et al.*	(CERN, LBL, BOST+)	REFID=43653
AMSLER	93	ZPHY C58 175	C. Amsler *et al.*	(Crystal Barrel Collab.)	REFID=43311
KESSLER	93	PRL 70 892	R.S. Kessler *et al.*	(Saturne SPES2 Collab.)	REFID=43208
PLOUIN	92	PL B276 526	F. Plouin *et al.*	(Saturne SPES4 Collab.)	REFID=41807
BARU	90	ZPHY C48 581	S.E. Baru *et al.*	(MD-1 Collab.)	REFID=41366
ROE	90	PR D41 17	N.A. Roe *et al.*	(ASP Collab.)	REFID=41014
WILLIAMS	88	PR D38 1365	D.A. Williams *et al.*	(Crystal Ball Collab.)	REFID=40567
AIHARA	86	PR D33 844	H. Aihara *et al.*	(TPC-2γ Collab.)	REFID=10845
BARTEL	85E	PL 160B 421	W. Bartel *et al.*	(JADE Collab.)	REFID=10843
LANDSBERG	85	PRPL 128 301	L.G. Landsberg	(SERP)	REFID=10844
ALDE	84	ZPHY C25 225	D.M. Alde *et al.*	(SERP, BELG, LAPP)	REFID=10841
Also		SJNP 40 918 Translated from YAF 40 1447.	D.M. Alde *et al.*	(SERP, BELG, LAPP)	REFID=10842
WEINSTEIN	83	PR D28 2896	A.J. Weinstein *et al.*	(Crystal Ball Collab.)	REFID=10840
BINON	82	SJNP 36 391 Translated from YAF 36 670.	F.G. Binon *et al.*	(SERP, BELG, LAPP+)	REFID=10838
Also		NC 71A 497	F.G. Binon *et al.*	(SERP, BELG, LAPP+)	REFID=10839
DAVYDOV	81	LNC 32 45	V.A. Davydov *et al.*	(SERP, BELG, LAPP+)	REFID=10834
Also		SJNP 33 825 Translated from YAF 33 1534.	V.A. Davydov *et al.*	(SERP, BELG, LAPP+)	REFID=10835
DZHELYADIN	81	PL 105B 239	R.I. Dzhelyadin *et al.*	(SERP)	REFID=10836
Also		SJNP 33 822 Translated from YAF 33 1529.	R.I. Dzhelyadin *et al.*	(SERP)	REFID=10837
ABROSIMOV	80	SJNP 31 195 Translated from YAF 31 371.	A.T. Abrosimov *et al.*	(JINR)	REFID=10829
DZHELYADIN	80	PL 94B 548	R.I. Dzhelyadin *et al.*	(SERP)	REFID=10831
Also		SJNP 32 516 Translated from YAF 32 998.	R.I. Dzhelyadin *et al.*	(SERP)	REFID=10830
DZHELYADIN	80B	PL 97B 471	R.I. Dzhelyadin *et al.*	(SERP)	REFID=10833
Also		SJNP 32 518 Translated from YAF 32 1002.	R.I. Dzhelyadin *et al.*	(SERP)	REFID=10832
BUSHNIN	78	PL 79B 147	Y.B. Bushnin *et al.*	(SERP)	REFID=10827
Also		SJNP 28 775 Translated from YAF 28 1507.	Y.B. Bushnin *et al.*	(SERP)	REFID=10828
MARTYNOV	76	SJNP 23 48 Translated from YAF 23 93.	A.S. Martynov *et al.*	(JINR)	REFID=10826

JANE	75	PL 59B 99	M.R. Jane *et al.*	(RHEL, LOWC)	REFID=10823
JANE	75B	PL 59B 103	M.R. Jane *et al.*	(RHEL, LOWC)	REFID=10824
Also		PL 73B 503	M.R. Jane		REFID=10825
Erratum in private communication.					
BROWMAN	74B	PRL 32 1067	A. Browman *et al.*	(CORN, BING)	REFID=10818
DAVIES	74	NC 24A 324	J.D. Davies, J.G. Guy, R.K.P. Zia	(BIRM, RHEL+)	REFID=10728
DUANE	74	PRL 32 425	A. Duane *et al.*	(LOIC, SHMP)	REFID=20284
JANE	74	PL 48B 260	M.R. Jane *et al.*	(RHEL, LOWC, SUSS)	REFID=10820
JANE	74B	PL 48B 265	M.R. Jane *et al.*	(RHEL, LOWC, SUSS)	REFID=10821
KENDALL	74	NC 21A 387	B.N. Kendall *et al.*	(BROW, BARI, MIT)	REFID=10822
LAYTER	73	PR D7 2565	J.G. Layter *et al.*	(COLU)	REFID=10816
THALER	73	PR D7 2569	J.J. Thaler *et al.*	(COLU)	REFID=10817
AGUILAR-...	72B	PR D6 29	M. Aguilar-Benitez *et al.*	(BNL)	REFID=20205
BLOODWO...	72B	NP B39 525	I.J. Bloodworth *et al.*	(TNTO)	REFID=10813
LAYTER	72	PRL 29 316	J.G. Layter *et al.*	(COLU)	REFID=10814
THALER	72	PRL 29 313	J.J. Thaler *et al.*	(COLU)	REFID=10815
BASILE	71D	NC 3A 796	M. Basile *et al.*	(CERN, BGNA, STRB)	REFID=10810
STRUGALSKI	71	NP B27 429	Z.S. Strugalski *et al.*	(JINR)	REFID=10811
BAGLIN	70	NP B22 66	C. Baglin *et al.*	(EPOL, MADR, STRB)	REFID=10796
BUTTRAM	70	PRL 25 1358	M.T. Buttram, M.N. Kreisler, R.E. Mischke	(PRIN)	REFID=10801
CARPENTER	70	PR D1 1303	D.W. Carpenter *et al.*	(DUKE)	REFID=10802
COX	70B	PRL 24 534	B. Cox, L. Fortney, J.P. Golson	(DUKE)	REFID=10803
DANBURG	70	PR D2 2564	J.S. Danburg *et al.*	(LRL)	REFID=10804
DEVONS	70	PR D1 1936	S. Devons *et al.*	(COLU, SYRA)	REFID=10805
GORMLEY	70	PR D2 501	M. Gormley *et al.*	(COLU, BNL)	REFID=10806
Also		Thesis Nevis 181	M. Gormley	(COLU)	REFID=10807
BAGLIN	69	PL 29B 445	C. Baglin *et al.*	(EPOL, UCB, MADR, STRB)	REFID=10795
Also		NP B22 66	C. Baglin *et al.*	(EPOL, MADR, STRB)	REFID=10796
HYAMS	69	PL 29B 128	B.D. Hyams *et al.*	(CERN, MPIM)	REFID=10797
ARNOLD	68	PL 27B 466	R.G. Arnold *et al.*	(STRB, MADR, EPOL+)	REFID=10790
BAZIN	68	PRL 20 895	M.J. Bazin *et al.*	(PRIN, QUKI)	REFID=10791
BULLOCK	68	PL 27B 402	F.W. Bullock *et al.*	(LOUC)	REFID=10792
CNOPS	68	PRL 21 1609	A.M. Cnops *et al.*	(BNL, ORNL, UCND+)	REFID=20789
GORMLEY	68C	PRL 21 402	M. Gormley *et al.*	(COLU, BNL)	REFID=10793
WEHMANN	68	PRL 20 748	A.W. Wehmann *et al.*	(HARV, CASE, SLAC+)	REFID=10794
BAGLIN	67	PL 24B 637	C. Baglin *et al.*	(EPOL, UCB)	REFID=10774
BAGLIN	67B	BAPS 12 567	C. Baglin *et al.*	(EPOL, UCB)	REFID=10775
BALTAY	67B	PRL 19 1498	C. Baltay *et al.*	(COLU, STON)	REFID=10777
BALTAY	67D	PRL 19 1495	C. Baltay *et al.*	(COLU, BRAN)	REFID=10776
BEMPORAD	67	PL 25B 380	C. Bemporad *et al.*	(PISA, BONN)	REFID=10778
Also		Private Comm.	I. Ion		REFID=10779
BILLING	67	PL 25B 435	K.D. Billing *et al.*	(LOUC, OXF)	REFID=10780
BUNIATOV	67	PL 25B 560	S.A. Bunyatov *et al.*	(CERN, KARL)	REFID=10782
CENCE	67	PRL 19 1393	R.J. Cence *et al.*	(HAWA, LRL)	REFID=10783
ESTEN	67	PL 24B 115	M.J. Esten *et al.*	(LOUC, OXF)	REFID=10784
FELDMAN	67	PRL 18 868	M. Feldman *et al.*	(PENN)	REFID=10785
FLATTE	67	PRL 18 976	S.M. Flatte	(LRL)	REFID=10786
FLATTE	67B	PR 163 1441	S.M. Flatte, C.G. Wohl	(LRL)	REFID=10787
LITCHFIELD	67	PL 24B 486	P.J. Litchfield *et al.*	(RHEL, SACL)	REFID=10788
PRICE	67	PRL 18 1207	L.R. Price, F.S. Crawford	(LRL)	REFID=10789
ALFF-...	66	PR 145 1072	C. Alff-Steinberger *et al.*	(COLU, RUTG)	REFID=10762
CLPWY	66	PR 149 1044	C. Baltay	(SCUC, LRL, PURD, WISC, YALE)	REFID=10764
CRAWFORD	66	PRL 16 333	F.S. Crawford, L.R. Price	(LRL)	REFID=10766
DIGIUGNO	66	PRL 16 767	G. di Giugno *et al.*	(NAPL, TRST, FRAS)	REFID=10767
GRUNHAUS	66	Thesis	J. Grunhaus	(COLU)	REFID=10769
JAMES	66	PR 142 896	F.E. James, H.L. Kraybill	(YALE, BNL)	REFID=10770
JONES	66	PL 23 597	W.G. Jones *et al.*	(LOIC, RHEL)	REFID=10771
LARRIBE	66	PL 23 600	A. Larribe *et al.*	(SACL, RHEL)	REFID=10772
FOSTER	65	PR 138 B652	M. Foster *et al.*	(WISC, PURD)	REFID=10757
FOSTER	65B	Athens Conf.	M. Foster, M. Good, M. Meer	(WISC)	REFID=10758
FOSTER	65C	Thesis	M. Foster	(WISC)	REFID=10759
PRICE	65	PRL 15 123	L.R. Price, F.S. Crawford	(LRL)	REFID=10760
RITTENBERG	65	PRL 15 556	A. Rittenberg, G.R. Kalbfleisch	(LRL, BNL)	REFID=10761
FOELSCHE	64	PR 134 B1138	H.W.J. Foelsche, H.L. Kraybill	(YALE)	REFID=10754
KRAEMER	64	PR 136 B496	R.W. Kraemer *et al.*	(JHU, NWES, WOOD)	REFID=10755
PAULI	64	PL 13 351	E. Pauli, A. Muller	(SACL)	REFID=10756
BACCI	63	PRL 11 37	C. Bacci *et al.*	(ROMA, FRAS)	REFID=10750
CRAWFORD	63	PRL 10 546	F.S.Jr. Crawford, L.J. Lloyd, E.C. Fowler	(LRL+)	REFID=10751
Also		PRL 16 907	F.S. Crawford, L.J. Lloyd, E.C. Fowler	(LRL+)	REFID=10752
ALFF-...	62	PRL 9 322	C. Alff-Steinberger *et al.*	(COLU, RUTG)	REFID=10746
BASTIEN	62	PRL 8 114	P.L. Bastien *et al.*	(LRL)	REFID=10747
PICKUP	62	PRL 8 329	E. Pickup, D.K. Robinson, E.O. Salant	(CNRC+)	REFID=10749