η

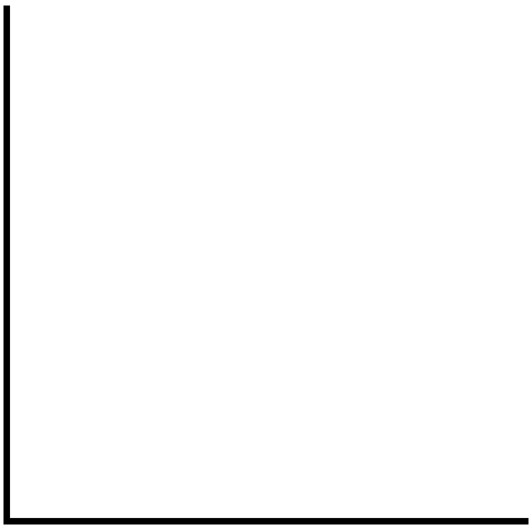
$I^G(J^{PC}) = 0^+(0^{-+})$

We have omitted some results that have been superseded by later experiments.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

Measurements with an error $\geq$ 2 MeV are omitted from the average.

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
547.45±0.19 OUR AVERAGE	Error includes scale factor of 1.6. See the ideogram below.				
547.30±0.15		PLOUIN	92	SPEC	$d p \rightarrow \eta\, ^3\mathrm{He}$
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	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
555.0 ±2.0	250	JAMES	66	HBC	
552.0 ±3.0	325	KRAEMER	64	DBC	
549.3 ±2.9		DELCOURT	63	CNTR	
546.0 ±4.0	35	PICKUP	62	HBC	



η mass (MeV)

η WIDTH

This is the partial decay rate $\Gamma(\eta \rightarrow \gamma\gamma)$ divided by the fitted branching fraction for that mode. See the "Note on the Decay Width $\Gamma(\eta \rightarrow \gamma\gamma)$," below.

VALUE (keV)	*DOCUMENT ID*
1.19±0.11 OUR FIT Error includes scale factor of 1.8.	

η DECAY MODES

	Mode		Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1	neutral modes		$(71.0\ ^{+0.8}_{-0.6})$ %	S=1.2
Γ_2	2γ	[a]	(39.0 ± 0.4) %	S=1.2
Γ_3	$3\pi^0$		$(31.99^{+0.40}_{-0.34})$ %	S=1.2
Γ_4	$\pi^0 2\gamma$		$(7.1 \pm 1.4) \times 10^{-4}$	
Γ_5	charged modes		$(28.9\ ^{+0.6}_{-0.8})$ %	S=1.2
Γ_6	$\pi^+\pi^-\pi^0$		$(23.4\ ^{+0.5}_{-0.6})$ %	S=1.3
Γ_7	$\pi^+\pi^-\gamma$		$(4.84^{+0.13}_{-0.15})$ %	S=1.2
Γ_8	$e^+e^-\gamma$		$(5.0 \pm 1.2) \times 10^{-3}$	
Γ_9	$\mu^+\mu^-\gamma$		$(3.1 \pm 0.4) \times 10^{-4}$	
Γ_{10}	e^+e^-		$< 3 \times 10^{-4}$	CL=90%
Γ_{11}	$\mu^+\mu^-$		$(5.8 \pm 0.8) \times 10^{-6}$	
Γ_{12}	$\pi^+\pi^-e^+e^-$		$(1.4\ ^{+1.3}_{-0.8}) \times 10^{-3}$	
Γ_{13}	$\pi^+\pi^-2\gamma$		$< 2.1 \times 10^{-3}$	
Γ_{14}	$\pi^+\pi^-\pi^0\gamma$		$< 6 \times 10^{-4}$	CL=90%
Γ_{15}	$\pi^0\mu^+\mu^-\gamma$		$< 3 \times 10^{-6}$	CL=90%

Charge conjugation (C), Parity (P), or Charge conjugation × Parity (CP) violating modes

	Mode			Fraction (Γ_i/Γ)	Confidence level
Γ_{16}	$\pi^+\pi^-$	P,CP		$< 1.5 \times 10^{-3}$	
Γ_{17}	3γ	C		$< 5 \times 10^{-4}$	CL=95%
Γ_{18}	$\pi^0 e^+e^-$	C	[b]	$< 4 \times 10^{-5}$	CL=90%
Γ_{19}	$\pi^0\mu^+\mu^-$	C	[b]	$< 5 \times 10^{-6}$	CL=90%

[a] See the "Note on the Decay Width $\Gamma(\eta \to \gamma\gamma)$" in these Full Listings.

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

CONSTRAINED FIT INFORMATION

An overall fit to a decay rate and 14 branching ratios uses 42 measurements and one constraint to determine 9 parameters. The overall fit has a $\chi^2 = 32.1$ for 34 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_3	52							
x_4	3	2						
x_6	−86	−81	−5					
x_7	−75	−71	−4	80				
x_8	−11	−11	−1	−3	−4			
x_9	0	0	0	0	0	0		
x_{12}	−4	−5	0	−12	−10	−2	0	
Γ	−13	−7	0	11	9	1	0	1
	x_2	x_3	x_4	x_6	x_7	x_8	x_9	x_{12}

	Mode		Rate (keV)	Scale factor
Γ_2	2γ	[a]	0.46 ± 0.04	1.8
Γ_3	$3\pi^0$		0.381 ± 0.035	1.8
Γ_4	$\pi^0 2\gamma$		$(8.5 \pm 1.9) \times 10^{-4}$	1.1
Γ_6	$\pi^+\pi^-\pi^0$		0.279 ± 0.028	1.7
Γ_7	$\pi^+\pi^-\gamma$		0.058 ± 0.006	1.7

*CITATION: L. Montanet et al., Physical Review D50, 1173 (1994) and 1995 off-year partial update for the 1996 edition (URL: http://pdg.lbl.gov/)

Γ_8	$e^+ e^- \gamma$	0.0059 ± 0.0015	1.1
Γ_9	$\mu^+ \mu^- \gamma$	$(3.7 \pm 0.6) \times 10^{-4}$	1.1
Γ_{12}	$\pi^+ \pi^- e^+ e^-$	$0.0016^{+0.0015}_{-0.0010}$	

MINIREVIEW GOES HERE

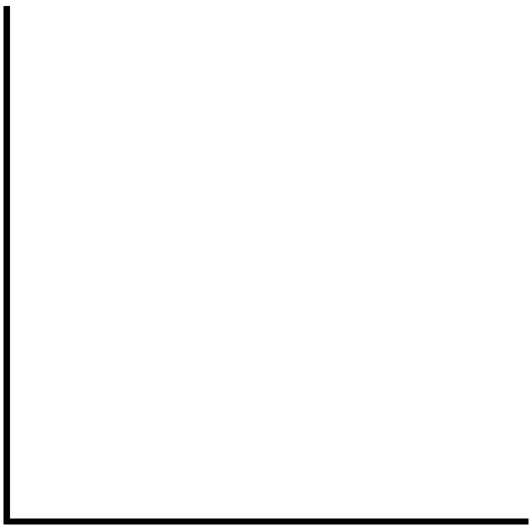
η DECAY RATES

$\Gamma(2\gamma)$ — Γ_2

See the "Note on the Decay Width $\Gamma(\eta \to \gamma\gamma)$," below.

VALUE (keV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
0.46 ±0.04 OUR FIT Error includes scale factor of 1.8.					
0.46 ±0.04 OUR AVERAGE Error includes scale factor of 1.8. See the ideogram below.					
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	$e^+ e^- \to e^+ e^- \eta$
0.324±0.046		BROWMAN	74B	CNTR	Primakoff effect
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.64 ±0.14 ±0.13		AIHARA	86	TPC	$e^+ e^- \to e^+ e^- \eta$
0.56 ±0.16	56	WEINSTEIN	83	CBAL	$e^+ e^- \to e^+ e^- \eta$
1.00 ±0.22		[1] BEMPORAD	67	CNTR	Primakoff effect

[1] 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.



$\Gamma(2\gamma)$ (keV)

η BRANCHING RATIOS

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

VALUE	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
$\mathbf{0.710^{+0.008}_{-0.006}}$ **OUR FIT** Error includes scale factor of 1.2.					
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	

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.5487±0.0028 OUR FIT Error includes scale factor of 1.1.					
0.549 ±0.004 OUR AVERAGE					
0.549 ±0.004		ALDE	84	GAM2	
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		[2] JONES	66	CNTR	

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

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.4503±0.0028 OUR FIT Error includes scale factor of 1.1.					
0.450 ±0.004 OUR AVERAGE					
0.450 ±0.004		ALDE	84	GAM2	
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

VALUE	DOCUMENT ID		TECN	COMMENT
0.821±0.009 OUR FIT Error includes scale factor of 1.1.				
0.841±0.030 OUR AVERAGE				
0.841±0.034	AMSLER	93	CBAR	LEAR $\overline{p}p$ at rest
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	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1.25 ±0.39	BACCI	63	CNTR	Inverse BR reported

$\Gamma(\pi^0 2\gamma)/\Gamma(\text{neutral modes})$ — $\Gamma_4/\Gamma_1 = \Gamma_4/(\Gamma_2+\Gamma_3+\Gamma_4)$

VALUE	DOCUMENT ID		TECN
0.00100±0.00020 OUR FIT			
0.0010 ±0.0002	ALDE	84	GAM2

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

These results are summarized in the review by LANDSBERG 85.

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
7.1±1.4 OUR FIT						
• • • We do not use the following data for averages, fits, limits, etc. • • •						
9.5±2.3		70	BINON	82	GAM2	See ALDE 84
<30	90	0	DAVYDOV	81	GAM2	$\pi^- p \rightarrow \eta n$

$\Gamma(\text{neutral modes})/[\Gamma(\pi^+\pi^-\pi^0)+\Gamma(\pi^+\pi^-\gamma)+\Gamma(e^+e^-\gamma)]$ — $\Gamma_1/(\Gamma_6+\Gamma_7+\Gamma_8) = (\Gamma_2+\Gamma_3+\Gamma_4)/(\Gamma_6+\Gamma_7+\Gamma_8)$

VALUE	EVTS	DOCUMENT ID		TECN
$2.47^{+0.09}_{-0.08}$ OUR FIT Error includes scale factor of 1.2.				
2.64±0.23		BALTAY	67B	DBC
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.5 ±1.0	280	[3] JAMES	66	HBC
3.20±1.26	53	[3] BASTIEN	62	HBC
2.5 ±1.0	10	[3] PICKUP	62	HBC

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

$\Gamma(2\gamma)/\left[\Gamma(\pi^+\pi^-\pi^0)+\Gamma(\pi^+\pi^-\gamma)+\Gamma(e^+e^-\gamma)\right]$ — $\Gamma_2/(\Gamma_6+\Gamma_7+\Gamma_8)$

VALUE	EVTS	DOCUMENT ID		TECN
$1.35^{+0.05}_{-0.04}$ 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

$\Gamma(\text{neutral modes})/\Gamma(\pi^+\pi^-\pi^0)$ — $\Gamma_1/\Gamma_6 = (\Gamma_2+\Gamma_3+\Gamma_4)/\Gamma_6$

VALUE	EVTS	DOCUMENT ID		TECN
$3.03^{+0.11}_{-0.09}$ OUR FIT Error includes scale factor of 1.2.				
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	[4] 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

[4] Error increased from published value 0.5 by Bloodworth (private communication).

$\Gamma(2\gamma)/\Gamma(\pi^+\pi^-\pi^0)$ — Γ_2/Γ_6

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$1.66^{+0.06}_{-0.05}$ OUR FIT Error includes scale factor of 1.2.					
1.75±0.13 OUR AVERAGE					
1.78±0.10±0.13	1077	AMSLER	95	CBAR	$\overline{p}p$ LEAR
1.72±0.25	401	BAGLIN	69	HLBC	
1.61±0.39		FOSTER	65	HBC	

$\Gamma(3\pi^0)/\Gamma(\pi^+\pi^-\pi^0)$ — Γ_3/Γ_6

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
$1.36^{+0.05}_{-0.04}$ OUR FIT Error includes scale factor of 1.2.					
1.34±0.10 OUR AVERAGE Error includes scale factor of 1.2.					
1.44±0.09±0.10	1627	AMSLER	95	CBAR	$\overline{p}p$ LEAR
$1.50^{+0.15}_{-0.29}$	199	BAGLIN	69	HLBC	
$1.47^{+0.20}_{-0.17}$		BULLOCK	68	HLBC	
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	

$\Gamma(\pi^+\pi^-\gamma)/\Gamma(\pi^+\pi^-\pi^0)$ — Γ_7/Γ_6

VALUE	EVTS	DOCUMENT ID		TECN
0.207±0.004 OUR FIT Error includes scale factor of 1.1.				
0.207±0.004 OUR AVERAGE Error includes scale factor of 1.1.				
0.209±0.004	18k	THALER	73	ASPK
0.201±0.006	7250	GORMLEY	70	ASPK
• • • We do not use the following data for averages, fits, limits, etc. • • •				
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

$\Gamma(e^+e^-\gamma)/\Gamma(\pi^+\pi^-\pi^0)$ — Γ_8/Γ_6

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
2.1±0.5 OUR FIT					
2.1±0.5	80	JANE	75B	OSPK	See the erratum

$\Gamma(\mu^+\mu^-\gamma)/\Gamma_{\text{total}}$ — Γ_9/Γ

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_{10}/Γ

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<3	90	DAVIES	74	RVUE	Uses ESTEN 67

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

VALUE (units 10^{-6})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
5.8±0.8 OUR AVERAGE						
5.7±0.7±0.5		114	ABEGG	94	SPEC	$p d \rightarrow \eta {}^3$He
6.5±2.1		27	DZHELYADIN	80B	SPEC	$\pi^- p \rightarrow \eta n$
• • • 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_{11}/Γ_2

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

$\Gamma(\pi^+\pi^-e^+e^-)/\Gamma(\pi^+\pi^-\gamma)$ — Γ_{12}/Γ_7

VALUE	EVTS	DOCUMENT ID		TECN
$0.028^{+0.026}_{-0.017}$ OUR FIT				
0.026±0.026	1	GROSSMAN	66	HBC

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

VALUE (units 10^{-2})	DOCUMENT ID		TECN
$0.14^{+0.13}_{-0.08}$ OUR FIT			
• • • We do not use the following data for averages, fits, limits, etc. • • •			
<0.7	RITTENBERG	65	HBC

$\Gamma(\pi^+\pi^-2\gamma)/\Gamma(\pi^+\pi^-\pi^0)$ — Γ_{13}/Γ_6

VALUE	CL%	DOCUMENT ID		TECN
<0.009		PRICE	67	HBC
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.016	95	BALTAY	67B	DBC

$\Gamma(\pi^+\pi^-\pi^0\gamma)/\Gamma(\pi^+\pi^-\pi^0)$ — Γ_{14}/Γ_6

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

$\Gamma(\pi^0\mu^+\mu^-\gamma)/\Gamma_{total}$ — Γ_{15}/Γ

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

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

Forbidden by *P* and *CP* invariance.

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN
<0.15	0	THALER	73	ASPK

$\Gamma(3\gamma)/\Gamma(\text{neutral modes})$ — $\Gamma_{17}/\Gamma_1 = \Gamma_{17}/(\Gamma_2+\Gamma_3+\Gamma_4)$

Forbidden by *C* invariance.

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN
<7	95	ALDE	84	GAM2

$\Gamma(\pi^0 e^+ e^-)/\Gamma(\pi^+ \pi^- \pi^0)$ — Γ_{18}/Γ_6

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

VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN
< 1.9	90		JANE	75	OSPK
• • • We do not use the following data for averages, fits, limits, etc. • • •					
< 42	90		BAGLIN	67	HLBC
< 16	90	0	BILLING	67	HLBC
< 77		0	FOSTER	65B	HBC
<110			PRICE	65	HBC

$\Gamma(\pi^0 e^+ e^-)/\Gamma_{total}$ — Γ_{18}/Γ

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

VALUE (units 10^{-2})	CL%	EVTS	DOCUMENT ID		TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.016	90	0	MARTYNOV	76	HLBC
<0.084	90		BAZIN	68	DBC
<0.7			RITTENBERG	65	HBC

$\Gamma(\pi^0 \mu^+ \mu^-)/\Gamma_{total}$ — Γ_{19}/Γ

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

VALUE (units 10^{-4})	CL%	DOCUMENT ID		TECN	COMMENT
<0.05	90	DZHELYADIN	81	SPEC	$\pi^- p \rightarrow \eta n$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<5		WEHMANN	68	OSPK	

MINIREVIEW GOES HERE

η *C*-NONCONSERVING DECAY PARAMETERS

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

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN
0.09±0.17 OUR AVERAGE				
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	[5] GORMLEY	68C	ASPK

[5] The GORMLEY 68C asymmetry is probably due to unmeasured (**E** × **B**) spark chamber effects. New experiments with (**E** × **B**) controls don't observe an asymmetry.

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

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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN
0.18±0.16 OUR AVERAGE				
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

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN
−0.17±0.17 OUR AVERAGE				
−0.30±0.25	165k	JANE	74	OSPK
−0.07±0.22	220k	LAYTER	72	ASPK

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

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

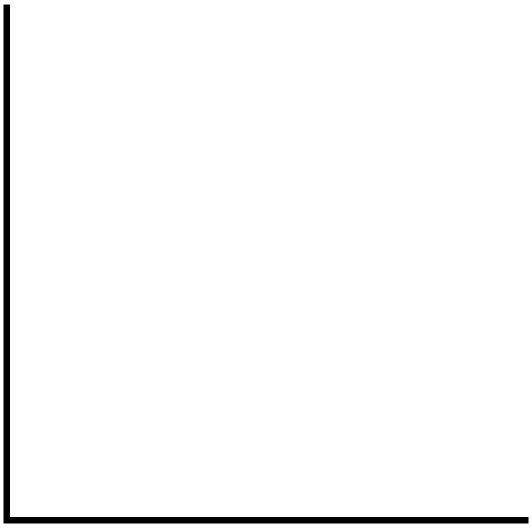
VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN
0.9 ±0.4 OUR AVERAGE				
1.2 ±0.6	35k	JANE	74B	OSPK
0.5 ±0.6	36k	THALER	72	ASPK
1.22±1.56	7257	GORMLEY	70	ASPK

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

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

VALUE	EVTS	DOCUMENT ID		TECN
0.05 ±0.06 OUR AVERAGE		Error includes scale factor of 1.5. See the ideogram below.		
0.11 ±0.11	35k	JANE	74B	OSPK
0.12 ±0.06		[6] THALER	72	ASPK
−0.060±0.065	7250	GORMLEY	70	WIRE

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



$\eta \rightarrow \ \pi^+\pi^-\gamma$ parameter β (*D*-wave)

ENERGY DEPENDENCE OF $\eta \rightarrow \ \pi^+\pi^-\pi^0$ DALITZ PLOT

See the Note on η Decay Parameters above. The following experiments fit to one or more of the coefficients *a*, *b*, *c*, *d*, or *e* for $|\text{matrix element}|^2 = 1 + ay + by^2 + cx + dx^2 + exy$.

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
	1077	[7] AMSLER	95	CBAR	$\overline{p}p$ LEAR
	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	

[7] AMSLER 95 fits to $(1{+}ay{+}by^2)$ and obtains $a{=}-0.94 \pm 0.15$ and $b{=}0.11 \pm 0.27$.

α PARAMETER FOR $\eta \rightarrow \ 3\pi^0$

See the Note on η Decay Parameters above. The value here is of α in $|\text{matrix element}|^2 = 1 + 2\alpha z$.

VALUE	EVTS	DOCUMENT ID		TECN
−0.022±0.023	50k	ALDE	84	GAM2
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−0.32 ±0.37	192	BAGLIN	70	HLBC

η REFERENCES

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

AMSLER	95	PL B346 203	+Armstrong+	(Crystal Barrel Collab.)
ABEGG	94	PR D50 92	+Baldisseri, Boudard+	(SPES-II Collab.)
AMSLER	93	ZPHY C58 175	+Armstrong, Augustin+	(Crystal Barrel Collab.)
KESSLER	93	PRL 70 892	+Abegg, Baldisseri+	(SPES-II Collab.)
PLOUIN	92	PL B276 526	+	(SACL, EPOL, IPN, SACL, GWU, UCLA, BGUN, LOUC)
BARU	90	ZPHY C48 581	+Blinov, Blinov+	(MD-1 Collab.)
ROE	90	PR D41 17	+Bartha, Burke, Garbincius+	(ASP Collab.)
PDG	88	PL B204	Yost, Barnett+	(LBL+)
WILLIAMS	88	PR D38 1365	+Antreasyan, Bartels, Besset+	(Crystal Ball Collab.)
AIHARA	86	PR D33 844	+Alston-Garnjost+	(TPC-2γ Collab.)
BARTEL	85E	PL 160B 421	+Becker, Cords, Felst+	(JADE Collab.)
LANDSBERG	85	PRPL 128 310		(SERP)
ALDE	84	ZPHY C25 225	+Binon, Bricman, Donskov+	(SERP, BELG, LAPP)
Also	84B	SJNP 40 918	Alde, Binon, Bricman+	(SERP, BELG, LAPP)
		Translated from YAF 40 1447.		
WEINSTEIN	83	PR D28 2896	+Antreasyan, Gu, Kollman+	(Crystal Ball Collab.)
BINON	82	SJNP 36 391	+Bricman, Gouanere+	(SERP, BELG, LAPP, CERN)
		Translated from YAF 36 670.		
Also	82B	NC 71A 497	Binon, Bricman+	(SERP, BELG, LAPP, CERN)
DAVYDOV	81	LNC 32 45	+Donskov, Inyakin+	(SERP, BELG, LAPP, CERN)
Also	81B	SJNP 33 825	Davydov, Binon+	(SERP, BELG, LAPP, CERN)
		Translated from YAF 33 1534.		
DZHELYADIN	81	PL 105B 239	+Golovkin, Konstantinov, Kubarovski+	(SERP)
Also	81C	SJNP 33 822	Dzhelyadin, Viktorov, Golovkin+	(SERP)
		Translated from YAF 33 1529.		
ABROSIMOV	80	SJNP 31 195	+Ilina, Niszcz, Okhrimenko+	(JINR)
		Translated from YAF 31 371.		
DZHELYADIN	80	PL 94B 548	+Viktorov, Golovkin+	(SERP)
Also	80C	SJNP 32 516	Dzhelyadin, Golovkin, Kachanov+	(SERP)
		Translated from YAF 32 998.		
DZHELYADIN	80B	PL 97B 471	+Viktorov, Golovkin+	(SERP)
Also	80D	SJNP 32 518	Dzhelyadin, Golovkin, Kachanov+	(SERP)
		Translated from YAF 32 1002.		
BUSHNIN	78	PL 79B 147	+Dzhelyadin, Golovkin, Gritsuk+	(SERP)
Also	78B	SJNP 28 775	Bushnin, Golovkin, Gritsuk, Dzhelyadin+	(SERP)
		Translated from YAF 28 1507.		
MARTYNOV	76	SJNP 23 48	+Saltykov, Tarasov, Uzhinskii	(JINR)
		Translated from YAF 23 93.		
JANE	75	PL 59B 99	+Grannis, Jones, Lipman, Owen+	(RHEL, LOWC)
JANE	75B	PL 59B 103	+Grannis, Jones, Lipman, Owen+	(RHEL, LOWC)
Also	78B	PL 73B 503	Jane	
Erratum in private communication.				
BROWMAN	74B	PRL 32 1067	+Dewire, Gittelman, Hanson, Loh+	(CORN, BING)
DAVIES	74	NC 24A 324	+Guy, Zia	(BIRM, RHEL, SHMP)
DUANE	74	PRL 32 425	+Binnie, Camilleri, Carr+	(LOIC, SHMP)
JANE	74	PL 48B 260	+Jones, Lipman, Owen+	(RHEL, LOWC, SUSS)
JANE	74B	PL 48B 265	+Jones, Lipman, Owen+	(RHEL, LOWC, SUSS)
KENDALL	74	NC 21A 387	+Lanou, Massimo, Shapiro+	(BROW, BARI, MIT)
LAYTER	73	PR D7 2565	+Appel, Kotlewski, Lee, Stein, Thaler	(COLU)
THALER	73	PR D7 2569	+Appel, Kotlewski, Layter, Lee, Stein	(COLU)
AGUILAR-...	72B	PR D6 29	Aguilar-Benitez, Chung, Eisner, Samios	(BNL)
BLOODWO...	72B	NP B39 525	Bloodworth, Jackson, Prentice, Yoon	(TNTO)
LAYTER	72	PRL 29 316	+Appel, Kotlewski, Lee, Stein, Thaler	(COLU)
THALER	72	PRL 29 313	+Appel, Kotlewski, Layter, Lee, Stein	(COLU)
BASILE	71D	NC 3A 796	+Bollini, Dalpiaz, Frabetti+	(CERN, BGNA, STRB)
STRUGALSKI	71	NP B27 429	+Chuvilo, Gemesy, Ivanovskaya+	(JINR)
BAGLIN	70	NP B22 66	+Bezaguet, Degrange+	(EPOL, MADR, STRB)
BUTTRAM	70	PRL 25 1358	+Kreisler, Mischke	(PRIN)
CARPENTER	70	PR D1 1303	+Binkley, Chapman, Cox, Dagan+	(DUKE)
COX	70B	PRL 24 534	+Fortney, Golson	(DUKE)
DANBURG	70	PR D2 2564	+Abolins, Dahl, Davies, Hoch, Kirz+	(LRL)
DEVONS	70	PR D1 1936	+Grunhaus, Kozlowski, Nemethy+	(COLU, SYRA)
GORMLEY	70	PR D2 501	+Hyman, Lee, Nash, Peoples+	(COLU, BNL)
Also	70B	Thesis Nevis 181	Gormley	(COLU)
BAGLIN	69	PL 29B 445	+Bezaguet+	(EPOL, UCB, MADR, STRB)
Also	70	NP B22 66	Baglin, Bezaguet, Degrange+	(EPOL, MADR, STRB)
HYAMS	69	PL 29B 128	+Koch, Potter, VonLindern+	(CERN, MPIM)
ARNOLD	68	PL 27B 466	+Paty, Baglin, Bingham+	(STRB, MADR, EPOL, UCB)
BAZIN	68	PRL 20 895	+Goshaw, Zacher+	(PRIN, QUKI)
BULLOCK	68	PL 27B 402	+Esten, Fleming, Govan, Henderson+	(LOUC)
CNOPS	68	PRL 21 1609	+Hough, Cohn+	(BNL, ORNL, UCND, TENN, PENN)
GORMLEY	68C	PRL 21 402	+Hyman, Lee, Nash, Peoples+	(COLU, BNL)
WEHMANN	68	PRL 20 748	+Engels+	(HARV, CASE, SLAC, CORN, MCGI)
BAGLIN	67	PL 24B 637	+Bezaguet, Degrange+	(EPOL, UCB)
BAGLIN	67B	BAPS 12 567	+Bezaguet, Degrange+	(EPOL, UCB)
BALTAY	67B	PRL 19 1498	+Franzini, Kim, Newman+	(COLU, STON)
BALTAY	67D	PRL 19 1495	+Franzini, Kim, Newman+	(COLU, BRAN)
BEMPORAD	67	PL 25B 380	+Braccini, Foa, Lubelsmey+	(PISA, BONN)
Also	67	Private Comm.	Ion	
BILLING	67	PL 25B 435	+Bullock, Esten, Govan+	(LOUC, OXF)
BUNIATOV	67	PL 25B 560	+Zavattini, Deinet+	(CERN, KARL)
CENCE	67	PRL 19 1393	+Peterson, Stenger, Chiu+	(HAWA, LRL)
ESTEN	67	PL 24B 115	+Govan, Knight, Miller, Tovey+	(LOUC, OXF)
FELDMAN	67	PRL 18 868	+Frati, Gleeson, Halpern+	(PENN)
FLATTE	67	PRL 18 976		(LRL)

FLATTE	67B	PR 163 1441	+Wohl	(LRL)
LITCHFIELD	67	PL 24B 486	+Rangan, Segar, Smith+	(RHEL, SACL)
PRICE	67	PRL 18 1207	+Crawford	(LRL)
ALFF-...	66	PR 145 1072	Alff-Steinberger, Berley+	(COLU, RUTG)
CLPWY	66	PR 149 1044		(SCUC, LRL, PURD, WISC, YALE)
CRAWFORD	66	PRL 16 333	+Price	(LRL)
DIGIUGNO	66	PRL 16 767	+Giorgi, Silvestri+	(NAPL, TRST, FRAS)
GROSSMAN	66	PR 146 993	+Price, Crawford	(LRL)
GRUNHAUS	66	Thesis		(COLU)
JAMES	66	PR 142 896	+Kraybill	(YALE, BNL)
JONES	66	PL 23 597	+Binnie, Duane, Horsey, Mason+	(LOIC, RHEL)
LARRIBE	66	PL 23 600	+Leveque, Muller, Pauli+	(SACL, RHEL)
FOSTER	65	PR 138B 652	+Peters, Meer, Loeffler+	(WISC, PURD)
FOSTER	65B	Athens Conf.	+Good, Meer	(WISC)
FOSTER	65C	Thesis		(WISC)
PRICE	65	PRL 15 123	+Crawford	(LRL)
RITTENBERG	65	PRL 15 556	+Kalbfleisch	(LRL, BNL)
FOELSCHE	64	PR 134B 1138	+Kraybill	(YALE)
KRAEMER	64	PR 136B 496	+Madansky, Fields+	(JHU, NWES, WOOD)
PAULI	64	PL 13 351	+Muller	(SACL)
BACCI	63	PRL 11 37	+Penso, Salvini+	(ROMA, FRAS)
CRAWFORD	63	PRL 10 546	+Lloyd, Fowler	(LRL, DUKE)
Also	66B	PRL 16 907	Crawford, Lloyd, Fowler	(LRL, DUKE)
DELCOURT	63	PL 7 215	+Lefrancois, Perez-y-Jorba+	(ORSAY)
ALFF-...	62	PRL 9 322	Alff-Steinberger, Berley, Colley+	(COLU, RUTG)
BASTIEN	62	PRL 8 114	+Berge, Dahl, Ferro-Luzzi+	(LRL)
PICKUP	62	PRL 8 329	+Robinson, Salant	(CNRC, BNL)