

$\eta'(958)$

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

$\eta'(958)$ MASS

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
957.78 ± 0.14 OUR AVERAGE				
957.9 ± 0.2 ± 0.6	4800	WURZINGER 96	SPEC	1.68 $pd \rightarrow {}^3\text{He}\eta'$
959 ± 1	630	BELADIDZE 92C	VES	36 $\pi^- \text{Be} \rightarrow \pi^- \eta' \eta \text{Be}$
958 ± 1	340	ARMSTRONG 91B	OMEG	300 $pp \rightarrow pp\eta\pi^+\pi^-$
958.2 ± 0.4	622	AUGUSTIN 90	DM2	$J/\psi \rightarrow \gamma\eta\pi^+\pi^-$
957.8 ± 0.2	2420	AUGUSTIN 90	DM2	$J/\psi \rightarrow \gamma\gamma\pi^+\pi^-$
956.3 ± 1.0	143	GIDAL 87	MRK2	$e^+e^- \rightarrow e^+e^-\eta\pi^+\pi^-$
957.46 ± 0.33		DUANE 74	MMS	$\pi^- p \rightarrow n\text{MM}$
958.2 ± 0.5	1414	DANBURG 73	HBC	2.2 $K^- p \rightarrow \Lambda X^0$
958 ± 1	400	JACOBS 73	HBC	2.9 $K^- p \rightarrow \Lambda X^0$
956.1 ± 1.1	3415	BASILE 71	CNTR	1.6 $\pi^- p \rightarrow nX^0$
957.4 ± 1.4	535	BASILE 71	CNTR	1.6 $\pi^- p \rightarrow nX^0$
957 ± 1		RITTENBERG 69	HBC	1.7-2.7 $K^- p$

$\eta'(958)$ WIDTH

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
0.203 ± 0.016 OUR FIT Error includes scale factor of 1.3.					
0.30 ± 0.09 OUR AVERAGE					
0.40 ± 0.22	4800	WURZINGER 96	SPEC		1.68 $pd \rightarrow {}^3\text{He}\eta'$
0.28 ± 0.10	1000	BINNIE 79	MMS	0	$\pi^- p \rightarrow n\text{MM}$

$\eta'(958)$ DECAY MODES

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Γ_1 $\pi^+\pi^-\eta$	(43.8 \pm 1.5) %	S=1.1
Γ_2 $\rho^0\gamma$ (including non-resonant $\pi^+\pi^-\gamma$)	(30.2 \pm 1.3) %	S=1.1
Γ_3 $\pi^0\pi^0\eta$	(20.7 \pm 1.3) %	S=1.2
Γ_4 $\omega\gamma$	(3.01 \pm 0.30) %	
Γ_5 $\gamma\gamma$	(2.11 \pm 0.13) %	S=1.2
Γ_6 $3\pi^0$	(1.54 \pm 0.26) $\times 10^{-3}$	
Γ_7 $\mu^+\mu^-\gamma$	(1.03 \pm 0.26) $\times 10^{-4}$	
Γ_8 $\pi^+\pi^-\pi^0$	< 5 %	CL=90%
Γ_9 $\pi^0\rho^0$	< 4 %	CL=90%
Γ_{10} $\pi^+\pi^+\pi^-\pi^-$	< 1 %	CL=90%
Γ_{11} $\pi^+\pi^+\pi^-\pi^-$ neutrals	< 1 %	CL=95%
Γ_{12} $\pi^+\pi^+\pi^-\pi^-\pi^0$	< 1 %	CL=90%
Γ_{13} 6π	< 1 %	CL=90%
Γ_{14} $\pi^+\pi^-e^+e^-$	< 6 $\times 10^{-3}$	CL=90%
Γ_{15} $\pi^0\gamma\gamma$	< 8 $\times 10^{-4}$	CL=90%
Γ_{16} $4\pi^0$	< 5 $\times 10^{-4}$	CL=90%
Γ_{17} e^+e^-	< 2.1 $\times 10^{-7}$	CL=90%

Charge conjugation (C) or Parity (P) violating modes

Γ_{18} $\pi^+\pi^-$	P, CP	< 2 %	CL=90%
Γ_{19} $\pi^0\pi^0$	P, CP	< 9 $\times 10^{-4}$	CL=90%
Γ_{20} $\pi^0e^+e^-$	C [a]	< 1.3 %	CL=90%
Γ_{21} ηe^+e^-	C [a]	< 1.1 %	CL=90%
Γ_{22} 3γ	C	< 1.0 $\times 10^{-4}$	CL=90%
Γ_{23} $\mu^+\mu^-\pi^0$	C [a]	< 6.0 $\times 10^{-5}$	CL=90%
Γ_{24} $\mu^+\mu^-\eta$	C [a]	< 1.5 $\times 10^{-5}$	CL=90%

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

CONSTRAINED FIT INFORMATION

An overall fit to the total width, a partial width, 2 combinations of partial widths obtained from integrated cross section, and 16 branching ratios uses 46 measurements and one constraint to determine 7 parameters. The overall fit has a $\chi^2 = 34.4$ for 40 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle \delta p_i \delta p_j \rangle / (\delta p_i \cdot \delta p_j)$, in percent, from the fit to parameters p_i , including 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_2	-49					
x_3	-62	-35				
x_4	-27	-25	34			
x_5	-22	-13	27	8		
x_6	-23	-13	36	12	10	
Γ	34	-11	-21	-3	-83	-7
	x_1	x_2	x_3	x_4	x_5	x_6

	Mode	Rate (MeV)	Scale factor
Γ_1	$\pi^+ \pi^- \eta$	0.089 \pm 0.009	1.2
Γ_2	$\rho^0 \gamma$ (including non-resonant $\pi^+ \pi^- \gamma$)	0.061 \pm 0.005	1.3
Γ_3	$\pi^0 \pi^0 \eta$	0.042 \pm 0.004	1.5
Γ_4	$\omega \gamma$	0.0061 \pm 0.0008	1.2
Γ_5	$\gamma \gamma$	0.00427 \pm 0.00019	1.1
Γ_6	$3\pi^0$	(3.1 \pm 0.6) $\times 10^{-4}$	1.1

 $\eta'(958)$ PARTIAL WIDTHS **$\Gamma(\gamma\gamma)$** **Γ_5**

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
4.27 \pm 0.19 OUR FIT	Error includes scale factor of 1.1.			
4.37 \pm 0.25 OUR AVERAGE				
4.53 \pm 0.29 \pm 0.51	266	KARCH	92 CBAL	$e^+ e^- \rightarrow e^+ e^- \eta \pi^0 \pi^0$
3.61 \pm 0.13 \pm 0.48		¹ BEHREND	91 CELL	$e^+ e^- \rightarrow e^+ e^- \eta'(958)$
4.6 \pm 1.1 \pm 0.6	23	BARU	90 MD1	$e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \gamma$
4.57 \pm 0.25 \pm 0.44		BUTLER	90 MRK2	$e^+ e^- \rightarrow e^+ e^- \eta'(958)$
5.08 \pm 0.24 \pm 0.71	547	² ROE	90 ASP	$e^+ e^- \rightarrow e^+ e^- 2\gamma$
3.8 \pm 0.7 \pm 0.6	34	AIHARA	88C TPC	$e^+ e^- \rightarrow e^+ e^- \eta \pi^+ \pi^-$
4.9 \pm 0.5 \pm 0.5	136	³ WILLIAMS	88 CBAL	$e^+ e^- \rightarrow e^+ e^- 2\gamma$

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

$4.7 \pm 0.6 \pm 0.9$	143	⁴ GIDAL	87 MRK2	$e^+e^- \rightarrow e^+e^-\eta\pi^+\pi^-$
4.0 ± 0.9		⁵ BARTEL	85E JADE	$e^+e^- \rightarrow e^+e^-2\gamma$

¹ Revaluated by us using $B(\eta' \rightarrow \rho(770)\gamma) = (30.2 \pm 1.3)\%$.

² Revaluated by us using $B(\eta' \rightarrow \gamma\gamma) = (2.11 \pm 0.13)\%$.

³ Revaluated by us using $B(\eta' \rightarrow \gamma\gamma) = (2.11 \pm 0.13)\%$.

⁴ Superseded by BUTLER 90.

⁵ Systematic error not evaluated.

$\eta'(958) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

This combination of a partial width with the partial width into $\gamma\gamma$ and with the total width is obtained from the integrated cross section into channel(i) in the $\gamma\gamma$ annihilation.

$\Gamma(\gamma\gamma) \times \Gamma(\rho^0\gamma(\text{including non-resonant}\pi^+\pi^-\gamma))/\Gamma_{\text{total}} \quad \Gamma_5\Gamma_2/\Gamma$

VALUE (keV)	EVTS	DOCUMENT ID	TECN	COMMENT
1.29 ± 0.06 OUR FIT	Error includes scale factor of 1.2.			
1.26 ± 0.07 OUR AVERAGE	Error includes scale factor of 1.2.			
$1.09 \pm 0.04 \pm 0.13$		BEHREND	91 CELL	$e^+e^- \rightarrow e^+e^-\rho(770)^0\gamma$
$1.35 \pm 0.09 \pm 0.21$		AIHARA	87 TPC	$e^+e^- \rightarrow e^+e^-\rho\gamma$
$1.13 \pm 0.04 \pm 0.13$	867	ALBRECHT	87B ARG	$e^+e^- \rightarrow e^+e^-\rho\gamma$
$1.53 \pm 0.09 \pm 0.21$		ALTHOFF	84E TASS	$e^+e^- \rightarrow e^+e^-\rho\gamma$
$1.14 \pm 0.08 \pm 0.11$	243	BERGER	84B PLUT	$e^+e^- \rightarrow e^+e^-\rho\gamma$
$1.73 \pm 0.34 \pm 0.35$	95	JENNI	83 MRK2	$e^+e^- \rightarrow e^+e^-\rho\gamma$
$1.49 \pm 0.13 \pm 0.027$	213	BARTEL	82B JADE	$e^+e^- \rightarrow e^+e^-\rho\gamma$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
$1.85 \pm 0.31 \pm 0.24$	43	BEHREND	83B CELL	$e^+e^- \rightarrow e^+e^-\rho\gamma$

$\Gamma(\gamma\gamma) \times \Gamma(\pi^0\pi^0\eta)/\Gamma_{\text{total}} \quad \Gamma_5\Gamma_3/\Gamma$

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
0.88 ± 0.07 OUR FIT	Error includes scale factor of 1.1.		
$0.92 \pm 0.06 \pm 0.11$	⁶ KARCH	92 CBAL	$e^+e^- \rightarrow e^+e^-\eta\pi^0\pi^0$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
$0.95 \pm 0.05 \pm 0.08$	⁷ KARCH	90 CBAL	$e^+e^- \rightarrow e^+e^-\eta\pi^0\pi^0$
$1.00 \pm 0.08 \pm 0.10$	^{7,8} ANTREASYAN	87 CBAL	$e^+e^- \rightarrow e^+e^-\eta\pi^0\pi^0$

⁶ Revaluated by us using $B(\eta \rightarrow \gamma\gamma) = (39.21 \pm 0.34)\%$. Supersedes ANTREASYAN 87 and KARCH 90.

⁷ Superseded by KARCH 92.

⁸ Using $BR(\eta \rightarrow 2\gamma) = (38.9 \pm 0.5)\%$.

$\eta'(958) \alpha$ PARAMETER

$$|\text{MATRIX ELEMENT}|^2 = (1 + \alpha\gamma)^2 + \alpha^2$$

VALUE	DOCUMENT ID	TECN	COMMENT
-0.058 ± 0.013	⁹ ALDE	86 GAM2	$38 \pi^- p \rightarrow n\eta 2\pi^0$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
-0.08 ± 0.03	⁹ KALBFLEISCH	74 RVUE	$\eta' \rightarrow \eta\pi^+\pi^-$
⁹ May not necessarily be the same for $\eta' \rightarrow \eta\pi^+\pi^-$ and $\eta' \rightarrow \eta\pi^0\pi^0$.			

$\eta'(958)$ BRANCHING RATIOS

$\Gamma(\pi^+\pi^-\eta(\text{neutral decay}))/\Gamma_{\text{total}} \quad 0.714\Gamma_1/\Gamma$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.313±0.011 OUR FIT	Error includes scale factor of 1.1.			
0.314±0.026	281	RITTENBERG 69	HBC	1.7-2.7 $K^- p$

$\Gamma(\pi^+\pi^-\text{neutrals})/\Gamma_{\text{total}} \quad (0.714\Gamma_1+0.286\Gamma_3+0.89\Gamma_4)/\Gamma$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.399±0.009 OUR FIT	Error includes scale factor of 1.1.			
0.36 ±0.05 OUR AVERAGE				
0.4 ±0.1	39	LONDON	66 HBC	2.24 $K^- p \rightarrow \Lambda\pi^+\pi^-\text{neutrals}$
0.35 ±0.06	33	BADIER	65B HBC	3 $K^- p$

$\Gamma(\pi^+\pi^-\eta(\text{charged decay}))/\Gamma_{\text{total}} \quad 0.286\Gamma_1/\Gamma$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.125±0.004 OUR FIT	Error includes scale factor of 1.1.			
0.116±0.013 OUR AVERAGE				
0.123±0.014	107	RITTENBERG 69	HBC	1.7-2.7 $K^- p$
0.10 ±0.04	10	LONDON	66 HBC	2.24 $K^- p \rightarrow \Lambda\pi^+\pi^-\pi^+\pi^-\pi^0$
0.07 ±0.04	7	BADIER	65B HBC	3 $K^- p$

$[\Gamma(\pi^0\pi^0\eta(\text{charged decay})) + \Gamma(\omega(\text{charged decay})\gamma)]/\Gamma_{\text{total}} \quad (0.286\Gamma_3+0.89\Gamma_4)/\Gamma$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.086±0.005 OUR FIT	Error includes scale factor of 1.2.			
0.045±0.029	42	RITTENBERG 69	HBC	1.7-2.7 $K^- p$

$\Gamma(\text{neutrals})/\Gamma_{\text{total}} \quad (0.714\Gamma_3+0.09\Gamma_4+\Gamma_5)/\Gamma$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.172±0.009 OUR FIT	Error includes scale factor of 1.1.			
0.187±0.017 OUR AVERAGE				
0.185±0.022	535	BASILE	71 CNTR	1.6 $\pi^- p \rightarrow nX^0$
0.189±0.026	123	RITTENBERG 69	HBC	1.7-2.7 $K^- p$

$\Gamma(\rho^0\gamma(\text{including non-resonant}\pi^+\pi^-\gamma))/\Gamma_{\text{total}} \quad \Gamma_2/\Gamma$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.302±0.013 OUR FIT	Error includes scale factor of 1.1.			
0.319±0.030 OUR AVERAGE				
0.329±0.033	298	RITTENBERG 69	HBC	1.7-2.7 $K^- p$
0.2 ±0.1	20	LONDON	66 HBC	2.24 $K^- p \rightarrow \Lambda\pi^+\pi^-\gamma$
0.34 ±0.09	35	BADIER	65B HBC	3 $K^- p$

$\Gamma(\rho^0\gamma(\text{including non-resonant}\pi^+\pi^-\gamma))/\Gamma(\pi\pi\eta) \quad \Gamma_2/(\Gamma_1+\Gamma_3)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.469±0.029 OUR FIT	Error includes scale factor of 1.1.		
0.31 ±0.15	DAVIS	68 HBC	5.5 $K^- p$

$\Gamma(\pi^0 e^+ e^-)/\Gamma_{\text{total}}$					Γ_{20}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.013	90	RITTENBERG 65	HBC	2.7 $K^- p$	
$\Gamma(\eta e^+ e^-)/\Gamma_{\text{total}}$					Γ_{21}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.011	90	RITTENBERG 65	HBC	2.7 $K^- p$	
$\Gamma(\pi^0 \rho^0)/\Gamma_{\text{total}}$					Γ_9/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.04	90	RITTENBERG 65	HBC	2.7 $K^- p$	
$\Gamma(\pi^+ \pi^- e^+ e^-)/\Gamma_{\text{total}}$					Γ_{14}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.006	90	RITTENBERG 65	HBC	2.7 $K^- p$	
$\Gamma(6\pi)/\Gamma_{\text{total}}$					Γ_{13}/Γ
VALUE	CL%	DOCUMENT ID	TECN	COMMENT	
<0.01	90	LONDON 66	HBC	Compilation	
$\Gamma(\omega\gamma)/\Gamma(\pi^+ \pi^- \eta)$					Γ_4/Γ_1
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.069 ± 0.008 OUR FIT				Error includes scale factor of 1.1.	
0.068 ± 0.013	68	ZANFINO 77	ASPK	8.4 $\pi^- p$	
$\Gamma(\rho^0 \gamma (\text{including non-resonant } \pi^+ \pi^- \gamma))/[\Gamma(\pi^+ \pi^- \eta) + \Gamma(\pi^0 \pi^0 \eta) + \Gamma(\omega\gamma)]$					$\Gamma_2/(\Gamma_1 + \Gamma_3 + \Gamma_4)$
VALUE	DOCUMENT ID	TECN	COMMENT		
0.448 ± 0.028 OUR FIT				Error includes scale factor of 1.1.	
0.25 ± 0.14		DAUBER 64	HBC	1.95 $K^- p$	
$\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$					Γ_5/Γ
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.0211 ± 0.0013 OUR FIT				Error includes scale factor of 1.2.	
0.0196 ± 0.0015 OUR AVERAGE					
0.0200 ± 0.0018		¹⁰ STANTON 80	SPEC	8.45 $\pi^- p \rightarrow n\pi^+ \pi^- 2\gamma$	
0.025 ± 0.007		DUANE 74	MMS	$\pi^- p \rightarrow nMM$	
0.0171 ± 0.0033	68	DALPIAZ 72	CNTR	1.6 $\pi^- p \rightarrow nX^0$	
0.020 ^{+0.008} _{-0.006}	31	HARVEY 71	OSPK	3.65 $\pi^- p \rightarrow nX^0$	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.018 ± 0.002	6000	¹¹ APEL 79	NICE	15–40 $\pi^- p \rightarrow n2\gamma$	
¹⁰ Includes APEL 79 result.					
¹¹ Data is included in STANTON 80 evaluation.					
$\Gamma(e^+ e^-)/\Gamma_{\text{total}}$					Γ_{17}/Γ
VALUE (units 10^{-7})	CL%	DOCUMENT ID	TECN	COMMENT	
<2.1	90	VOROBYEV 88	ND	$e^+ e^- \rightarrow \pi^+ \pi^- \eta$	

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.02	90	RITTENBERG 69	HBC	1.7-2.7 $K^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.08	95	DANBURG 73	HBC	2.2 $K^- p \rightarrow \Lambda X^0$

 $\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$ Γ_8/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.05	90	RITTENBERG 69	HBC	1.7-2.7 $K^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.09	95	DANBURG 73	HBC	2.2 $K^- p \rightarrow \Lambda X^0$

 $\Gamma(\pi^+\pi^+\pi^-\pi^-\text{ neutrals})/\Gamma_{\text{total}}$ Γ_{11}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.01	95	DANBURG 73	HBC	2.2 $K^- p \rightarrow \Lambda X^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.01	90	RITTENBERG 69	HBC	1.7-2.7 $K^- p$

 $\Gamma(\pi^+\pi^+\pi^-\pi^-\pi^0)/\Gamma_{\text{total}}$ Γ_{12}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.01	90	RITTENBERG 69	HBC	1.7-2.7 $K^- p$

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.01	90	RITTENBERG 69	HBC	1.7-2.7 $K^- p$

 $\Gamma(\pi^0\pi^0\eta(3\pi^0\text{ decay}))/\Gamma_{\text{total}}$ $0.321\Gamma_3/\Gamma$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.066±0.004 OUR FIT	Error includes scale factor of 1.2.			
0.11 ±0.06	4	BENSINGER 70	DBC	2.2 $\pi^+ d$

 $\Gamma(\pi^0\gamma(\text{including non-resonant } \pi^+\pi^-\gamma))/\Gamma(\pi^+\pi^-\eta(\text{neutral decay}))$ $\Gamma_2/0.714\Gamma_1$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.97±0.07 OUR FIT	Error includes scale factor of 1.1.			
1.01±0.09 OUR AVERAGE				
1.07±0.17		BELADIDZE 92C	VES	36 $\pi^- \text{Be} \rightarrow \pi^- \eta' \eta \text{Be}$
0.92±0.14	473	DANBURG 73	HBC	2.2 $K^- p \rightarrow \Lambda X^0$
1.11±0.18	192	JACOBS 73	HBC	2.9 $K^- p \rightarrow \Lambda X^0$

 $\Gamma(\gamma\gamma)/\Gamma(\pi^0\pi^0\eta(\text{neutral decay}))$ $\Gamma_5/0.714\Gamma_3$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.143±0.010 OUR FIT	Error includes scale factor of 1.6.			
0.188±0.058	16	APEL 72	OSPK	3.8 $\pi^- p \rightarrow n X^0$

 $\Gamma(\mu^+\mu^-\gamma)/\Gamma(\gamma\gamma)$ Γ_7/Γ_5

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
4.9±1.2	33	VIKTOROV 80	CNTR	25,33 $\pi^- p \rightarrow 2\mu\gamma$

$\Gamma(\mu^+ \mu^- \eta)/\Gamma_{\text{total}}$					Γ_{24}/Γ
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<1.5	90	DZHELYADIN 81	CNTR	30 $\pi^- p \rightarrow \eta' n$	
$\Gamma(\mu^+ \mu^- \pi^0)/\Gamma_{\text{total}}$					Γ_{23}/Γ
<u>VALUE (units 10^{-5})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<6.0	90	DZHELYADIN 81	CNTR	30 $\pi^- p \rightarrow \eta' n$	
$\Gamma(3\pi^0)/\Gamma(\pi^0 \pi^0 \eta)$					Γ_6/Γ_3
<u>VALUE (units 10^{-4})</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
74 ± 12 OUR FIT					
74 ± 12 OUR AVERAGE					
74 ± 15		ALDE	87B	GAM2 38 $\pi^- p \rightarrow n 6\gamma$	
75 ± 18		BINON	84	GAM2 30-40 $\pi^- p \rightarrow n 6\gamma$	
$\Gamma(\gamma\gamma)/\Gamma(\pi^0 \pi^0 \eta)$					Γ_5/Γ_3
<u>VALUE</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.102 ± 0.007 OUR FIT	Error includes scale factor of 1.6.				
0.105 ± 0.010 OUR AVERAGE	Error includes scale factor of 1.9.				
0.091 ± 0.009		AMSLER	93	CBAR 0.0 $\bar{p} p$	
0.112 ± 0.002 ± 0.006		ALDE	87B	GAM2 38 $\pi^- p \rightarrow n 2\gamma$	
$\Gamma(\omega\gamma)/\Gamma(\pi^0 \pi^0 \eta)$					Γ_4/Γ_3
<u>VALUE</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.146 ± 0.014 OUR FIT					
0.147 ± 0.016		ALDE	87B	GAM2 38 $\pi^- p \rightarrow n 4\gamma$	
$\Gamma(3\gamma)/\Gamma(\pi^0 \pi^0 \eta)$					Γ_{22}/Γ_3
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<4.6	90	ALDE	87B	GAM2 38 $\pi^- p \rightarrow n 3\gamma$	
$\Gamma(\pi^0 \gamma\gamma)/\Gamma(\pi^0 \pi^0 \eta)$					Γ_{15}/Γ_3
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<37	90	ALDE	87B	GAM2 38 $\pi^- p \rightarrow n 4\gamma$	
$\Gamma(\pi^0 \pi^0)/\Gamma(\pi^0 \pi^0 \eta)$					Γ_{19}/Γ_3
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<45	90	ALDE	87B	GAM2 38 $\pi^- p \rightarrow n 4\gamma$	
$\Gamma(4\pi^0)/\Gamma(\pi^0 \pi^0 \eta)$					Γ_{16}/Γ_3
<u>VALUE (units 10^{-4})</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<23	90	ALDE	87B	GAM2 38 $\pi^- p \rightarrow n 8\gamma$	

$\eta'(958)$ C-NONCONSERVING DECAY PARAMETER

See the note on η decay parameters in the Stable Particle Particle Listings for definition of this parameter.

DECAY ASYMMETRY PARAMETER FOR $\pi^+ \pi^- \gamma$

VALUE	EVTs	DOCUMENT ID	TECN	COMMENT
-0.01 ± 0.04				OUR AVERAGE
-0.019 ± 0.056		AIHARA 87	TPC	$2\gamma \rightarrow \pi^+ \pi^- \gamma$
-0.069 ± 0.078	295	GRIGORIAN 75	STRC	$2.1 \pi^- p$
0.00 ± 0.10	103	KALBFLEISCH 75	HBC	$2.18 K^- p \rightarrow \Lambda \pi^+ \pi^- \gamma$
0.07 ± 0.08	152	RITTENBERG 65	HBC	$2.1-2.7 K^- p$

 $\eta'(958)$ REFERENCES

WURZINGER 96	PL B374 283	+Siebert+	(BONN, ORSAY, SACL, CRAC)
AMSLER 93	ZPHY C58 175	+Armstrong, Merkel+	(Crystal Barrel Collab.)
BELADIDZE 92C	SJNP 55 1535	+Bityukov, Borisov	(SERP, TBIL)
	Translated from YAF 55 2748.		
KARCH 92	ZPHY C54 33	+Antreasyan, Bartels+	(Crystal Ball Collab.)
ARMSTRONG 91B	ZPHY C52 389	+Barnes+	(ATHU, BARI, BIRM, CERN, CDEF)
BEHREND 91	ZPHY C49 401	+Criegee, Field, Franke+	(CELLO Collab.)
AUGUSTIN 90	PR D42 10	+Cosme+	(DM2 Collab.)
BARU 90	ZPHY C48 581	+Blinov, Blinov+	(MD-1 Collab.)
BUTLER 90	PR D42 1368	+Boyer+	(Mark II Collab.)
KARCH 90	PL B249 353	+Antreasyan, Bartels+	(Crystal Ball Collab.)
ROE 90	PR D41 17	+Bartha, Burke, Garbincius+	(ASP Collab.)
AIHARA 88C	PR D38 1	+Alston-Garnjost+	(TPC-2 γ Collab.)
VOROBYEV 88	SJNP 48 273	+Golubev, Dolinsky, Druzhinin+	(NOVO)
	Translated from YAF 48 436.		
WILLIAMS 88	PR D38 1365	+Antreasyan, Bartels, Besset+	(Crystal Ball Collab.)
AIHARA 87	PR D35 2650	+Alston-Garnjost+	(TPC-2 γ Collab.) JP
ALBRECHT 87B	PL B199 457	+Andam, Binder+	(ARGUS Collab.)
ALDE 87B	ZPHY C36 603	+Binon, Bricman+	(LANL, BELG, SERP, LAPP)
ANTREASYAN 87	PR D36 2633	+Bartels, Besset+	(Crystal Ball Collab.)
GIDAL 87	PRL 59 2012	+Boyer, Butler, Cords, Abrams+	(LBL, SLAC, HARV)
ALDE 86	PL B177 115	+Binon, Bricman+	(SERP, BELG, LANL, LAPP)
BARTEL 85E	PL 160B 421	+Becker, Cords, Felst+	(JADE Collab.)
ALTHOFF 84E	PL 147B 487	+Braunschweig, Kirschfink, Luebelsmeyer+	(TASSO Collab.)
BERGER 84B	PL 142B 125		(PLUTO Collab.)
BINON 84	PL 140B 264	+Donskov, Duteil+	(SERP, BELG, LAPP, CERN)
BEHREND 83B	PL 125B 518	+D'Agostini+	(CELLO Collab.)
Also 82C	PL 114B 378	Behrend, Chen, Fenner, Field+	(CELLO Collab.)
JENNI 83	PR D27 1031	+Burke, Telnov, Abrams, Blocker+	(SLAC, LBL)
BARTEL 82B	PL 113B 190	+Cords+	(JADE Collab.)
DZHELADIN 81	PL 105B 239	+Golovkin, Konstantinov, Kubarovski+	(SERP)
STANTON 80	PL 92 B 353	+Edwards, Legacey+	(OSU, CARL, MCGI, TNTO)
VIKTOROV 80	SJNP 32 520	+Golovkin, Dzhelyadin, Zaitsev, Mukhin+	(SERP)
	Translated from YAF 32 1005.		
APEL 79	PL 83B 131	Augenstein, Bertolucci(KARLK, KARLE, PISA, SERP, WIEN)	
BINNIE 79	PL 83B 141	+Carr, Debenham, Jones, Karami, Keyne+	(LOIC)
ZANFINO 77	PRL 38 930	+Brockman+	(CARL, MCGI, OHIO, TNTO)
GRIGORIAN 75	NP B91 232	+Ladage, Mellema, Rudnick+	(+)
KALBFLEISCH 75	PR D11 987	+Strand, Chapman	(BNL, MICH)
DUANE 74	PRL 32 425	+Binnie, Camilleri, Carr+	(LOIC, SHMP)
KALBFLEISCH 74	PR D10 916		(BNL)
DANBURG 73	PR D8 3744	+Kalbfleisch, Borenstein, Chapman+	(BNL, MICH) JP
JACOBS 73	PR D8 18	+Chang, Gauthier+	(BRAN, UMD, SYRA, TUFTS) JP

APEL	72	PL 40B 680	+Auslander, Muller, Bertolucci+	(KARLK, KARLE, PISA)
DALPIAZ	72	PL 42B 377	+Frabetti, Massam, Navarra, Zichichi	(CERN)
BASILE	71	NC 3A 371	+Bollini, Dalpiaz, Frabetti+	(CERN, BGNA, STRB)
HARVEY	71	PRL 27 885	+Marquit, Peterson, Rhoades+	(MINN, MICH)
BENSINGER	70	PL 33B 505	+Erwin, Thompson, Walker	(WISC)
RITTENBERG	69	Thesis UCRL 18863		(LRL) I
DAVIS	68	PL 27B 532	+Ammar, Mott, Dagan, Derrick+	(NWES, ANL)
LONDON	66	PR 143 1034	+Rau, Goldberg, Lichtman+	(BNL, SYRA) IJP
BADIER	65B	PL 17 337	+Demoulin, Barloutaud+	(EPOL, SACL, AMST)
RITTENBERG	65	PRL 15 556	+Kalbfleisch	(LRL, BNL)
DAUBER	64	PRL 13 449	+Slater, Smith, Stork, Ticho	(UCLA) JP

————— **OTHER RELATED PAPERS** —————

GRONBERG	98	PR D57 33	J. Gronberg, Hill, Kutschke+	(CLEO Collab.)
ABELE	97B	PL B402 195	A. Abele, Adomeit, Amsler+	(Crystal Barrel Collab.)
GENOVESE	94	ZPHY C61 425	+Lichtenberg, Pedrazzi	(TORI, IND)
BENAYOUN	93	ZPHY 58 31	+Feindt, Girone+	(CDEF, CERN, BARI)
KAMAL	92	PL B284 421	+Xu	(ALBE)
BICKERSTAFF	82	ZPHY C16 171	+McKellar	(MELB)
KIENZLE	65	PL 19 438	+Maglich, Levrat, Lefebvres+	(CERN)
TRILLING	65	PL 19 427	+Brown, Goldhaber, Kadyk, Scanio	(LRL)
GOLDBERG	64	PRL 12 546	+Gundzik, Lichtman, Connolly, Hart+	(SYRA, BNL)
GOLDBERG	64B	PRL 13 249	+Gundzik, Leitner, Connolly, Hart+	(SYRA, BNL)
KALBFLEISCH	64	PRL 12 527	+Alvarez, Barbaro-Galtieri+	(LRL) JP
KALBFLEISCH	64B	PRL 13 349	+Dahl, Rittenberg	(LRL) JP