energies. BROWMAN 74B also reanalyzed the data of BEMPORAD 67 and found that it was compatible with their fit, including background terms. This suggests that the background was underestimated by BEMPORAD 67, and we consider their result to be superseded by that of BROWMAN 74B.

There remains the disagreement between the two-photon results and the result of BROWMAN 74B. The errors assigned by BROWMAN 74B include a 5.3% statistical error, a 12.2% systematic error for uncertainty in the accepted photon spectrum, and a 2.5% systematic error for uncertainty in the nuclear parameters used in the calculation of the Primakoff and nuclear form factors. The Primakoff form factor F_C is a function of the momentum transfer q and the production angle θ. As $q^2 \to 0$, the uncertainty in F_C due to the q^2 dependence vanishes. The minimum q^2 in this experiment ranged from -680 MeV^2 at the lowest energy to -174 MeV^2 at the highest. In this range, the result is sensitive to details in the calculation of F_C, but it is difficult to estimate the systematic error of this dependence. Another possible source of systematic error is in the phase of the interference term, ϕ. This was a free parameter in the fit, but was not well determined by the data because the interference contribution peaks in the same angular region as the Primakoff signal and so cannot be unambiguously separated by an angular fit. A reanalysis of the data would be necessary to determine whether any of these factors was overlooked in the determination of the systematic error.

Using the same apparatus, Browman *et al.* [1] measured $\Gamma(\pi^0 \to \gamma\gamma)$ to be 7.92 ± 0.42 eV, in good agreement with our world average of 7.7 ± 0.6 eV. (Our average includes the measurement of Browman *et al.*, but is dominated by a decay-length measurement by Atherton *et al.* [2] The error on the average involves a scale factor S=3.0 due to one outlying measurement.) However, the uncertainty due to F_C is reduced at lower momentum transfers, and q^2 was on the order of 100 times smaller in the π^0 measurement. The signal-to-background ratio is also larger, making the fit less sensitive to nuclear production.

A possible source of common systematic error in the two-photon experiments is the calculation of the two-photon luminosity function. However, WILLIAMS 88 measured the two-photon width of the π^0 as well as of the η, and their result, $7.7 \pm 0.5 \pm 0.5$ eV, is consistent with the world average quoted above.

To summarize, the two-photon measurements seem more reliable than the best Primakoff-production measurement. However, we include the latter in our average as there is no compelling reason to exclude it. The result, $\Gamma(\eta \to \gamma\gamma) = 0.46\pm0.04$ keV, is about one standard deviation from the average using only the two-photon measurements, 0.510 ± 0.026 keV, and the error is larger, due to the scale factor.

References

1. A. Browman *et al.*, Phys. Rev. Lett. **33**, 1400 (1974).
2. H.W. Atherton *et al.*, Phys. Lett. **158B**, 81 (1985).

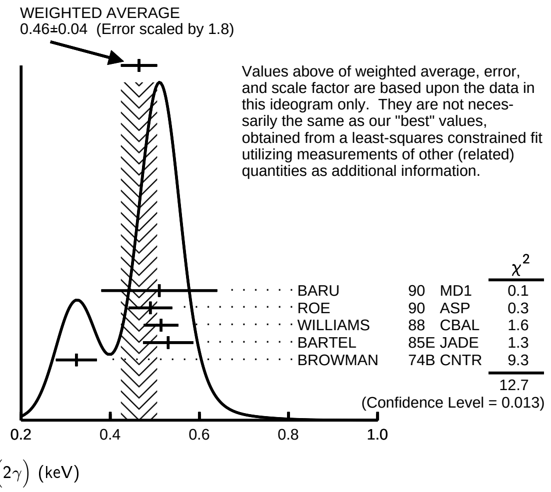
η DECAY RATES

$\Gamma(2\gamma)$ — 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.



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
0.708±0.008 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	