The resulting ratios $V(q^2, W)$ are listed in Table I. The quoted errors include the uncertainty in the subtraction of non-vector-meson events, as well as counting statistics. Clearly the vector-meson fraction in electroproduction is smaller than in photoproduction. Perhaps this should not be surprising, since the mismatch in photon and vector meson masses becomes greater as the virtual photon becomes more spacelike. It does imply, however, that other mechanisms besides vector-meson dominance are probably contributing to photon-hadron couplings in order to keep the total hadron production from decreasing with q^2 as rapidly as does the vector-meson production.[10] It also indicates that the absorption of virtual photons in the deep inelastic region is probably not diffraction dominated as some authors have suggested.[11]

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[8]The virtual photon is polarized, but if vector-meson electroproduction is predominantly diffractive as in photoproduction, there will be little or no φ dependence.

[9]For the range of t values detected in the experiment (-0.07 to -0.5 GeV^2) the quoted values for $V(q^2,W)$ are not sensitive to the assumed t dependence for distributions between e^{3t} and e^{10t}. Evidence for $d\sigma/dt = Ae^{(7\pm2)t}$ in photoproduction can be found in G. McClellan *et al.*, Phys. Rev. Lett. 22, 374 (1969); H. Alvensleben *et al.*, Phys. Rev. Lett. 23, 1058 (1969); and R. Anderson *et al.*, Phys. Rev. D 1, 27 (1970).

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Measurement of the $K_L{}^0$ Mean Life*

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We have measured the $K_L{}^0$ mean life to be $(5.154 \pm 0.044) \times 10^{-8}$ sec.

A new measurement of the mean life (τ) of the $K_L{}^0$ meson was made at the Princeton-Pennsylvania Accelerator by observing the exponential decrease in $K_L{}^0$ flux as a function of distance in a collimated neutral beam. We find $\tau = (5.151 \pm 0.044) \times 10^{-8}$ sec.

This scintillation-counter experiment was similar in almost all essential aspects to one described earlier.[1] The chief differences were improved collimator and detector geometries,

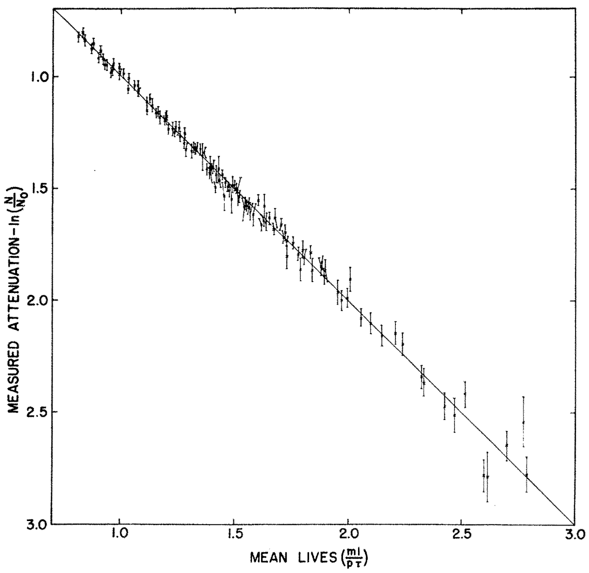

FIG. 1. The logarithm of the observed relative intensity of K_L^0 mesons as a function of the proper time in units of the fitted mean lifetime. The solid curve is the exponential fit to the data ($\chi^2=114$ for 107 degrees of freedom). The kaon mass is denoted by m, and p denotes its momentum; l is the distance between the kaon's creation and its decay.

increased statistical accuracy, and the larger number of decay lengths traversed by the detector. Details are discussed in a longer report.[2]

The quoted error represents $\pm0.042\times10^{-8}$ sec statistical uncertainty combined in quadrature with $\pm0.012\times10^{-8}$ sec from various sources of systematic uncertainty such as time-of-flight calibration, background subtraction, and normalization.

A plot of the observed relative intensity of K_L^0 decays as a function of the proper time is shown in Fig. 1 along with the fitted exponential decay curve obtained using the result of this experiment. The final data set consisted of 449 234 detected events; of these 13 774 were subtracted as background. The results of earlier, less precise experiments are shown together with our result in Table I.

The reported violation of the $\Delta I=\frac{1}{2}$ rule in $K_{\pi3}$ partial decay rates[8,9] depends directly on the accuracy of the K_L^0 lifetime measurement (total rate). The present result agrees well with that of Ref. 1, and supports the conclusion that the predictions of a pure $\Delta I=\frac{1}{2}$ rule are not correct.

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Table I. Measurements of the K_L^0 mean life.

τ (10^{-8} sec)	Ref.
$8.1\ ^{+3.2}_{-2.4}$	3
$5.1\ ^{+2.4}_{-1.3}$	4
$5.3\ \pm0.6$	5
$6.1\ ^{+1.5}_{-1.2}$	6
$5.15\ \pm0.14$	1
$5.0\ \pm0.5$	7
5.154 ± 0.044	This experiment
5.155 ± 0.042	Weighted average

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