and F. Linder [Phys. Rev. Lett. 21, 419 (1968)], and in this article, R_1 was shown in the figure as the ratio of cross sections, while in the text, it appeared as the ratio of intensities. Subsequently, this was interpreted by AH as the ratio of intensities and they calculated the corresponding ratio. On the other hand, R. J. W. Henry [Phys. Rev. A 2, 1349 (1970)] interpreted the same data as the ratio of cross sections and inadvertently also showed the AH result as the ratio of cross sections. This error was corrected by F. Linder and H. Schmidt [Z. Naturforsch 26a, 1603 (1971)] who apparently meant cross sections all along. The story should have ended there, but unfortunately, the same error reappeared in HC and was propagated by WS. All results in Fig. 1 represent the ratio of *cross sections.*

[8]Born approximation yields $\delta_{d\pi}=0.05$. J. C. Tully and R. S. Berry, J. Chem. Phys. 51, 2056 (1969), give $\delta_{d\pi}=0.014$, and R. L. Wilkins and H. S. Taylor, J. Chem. Phys. 47, 3532 (1967), give $\delta_{d\pi}=0.08$.

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Fermi Beta Decay, $A > 40$: The Half-lives of ^{46}V, ^{50}Mn, and ^{54}Co

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(Received 31 October 1974)

Half-lives for ^{46}V, ^{50}Mn, and ^{54}Co have been measured to be 423.4 ± 2.0, 284.0 ± 0.4, and 193.4 ± 0.4 msec, respectively. The ^{50}Mn result is significantly different from the previously accepted value, and brings the *ft* value for the decay of ^{50}Mn into agreement with all other accurately known $0^+ \rightarrow 0^+$ superallowed decays. These new data are in complete agreement with the predictions of conserved vector current theory.

The *ft* values of all superallowed β transitions between 0^+ ($T=1$) analog states should be equal, regardless of the specific nuclei involved, provided that small radiative corrections and charge-dependent effects are properly accounted for. Since this is a model-independent prediction of the conserved vector current (CVC) hypothesis, the approximate equality of measured *ft* values for such transitions has long been taken as supportive evidence for the validity of CVC. More recently, accurate *ft*-value measurements combined with detailed calculations of radiative and charge-dependent corrections (summarized by Towner and Hardy[1]) have placed this test of CVC on a more quantitative footing.

At the present time there are ten $0^+ \rightarrow 0^+$ transitions whose *ft* values have been determined with a quoted accuracy of better than ± 1%. At first it appeared that results for the six transitions between nuclei with $A < 40$ were consistent with one another but were in disagreement with the superallowed decays of ^{42}Sc, ^{46}V, ^{50}Mn, and ^{54}Co. However, in a recent Letter to this journal[2] we reported new masses for the four nuclei with $A > 40$, as a consequence of which the *ft* values for three of them came into agreement with those for lighter nuclei. Only ^{50}Mn remained anomalous.

We have now measured the half-lives of ^{46}V, ^{50}Mn, and ^{54}Co and have found a significant disagreement with the previously accepted ^{50}Mn value. Our findings leave all ten accurately known *ft* values statistically concordant with one another as anticipated by CVC.

The nuclei ^{46}V, ^{50}Mn, and ^{54}Co were produced through the (p,n) reaction by bombarding self-supporting targets of ^{46}Ti (82% enriched, 1 mg/cm^2), ^{50}Cr (97% enriched, 20 mg/cm^2), and ^{54}Fe (97% enriched, 2 mg/cm^2) with 10-MeV protons from the Chalk River MP tandem accelerator. Each target was bombarded for two half-lives after which the beam was interrupted and the counting begun. Positrons from the targets were detected in a 2.5-cm-diam × 3.5-cm-thick NE102 plastic scintillator mounted on an RCA6342 photomultiplier tube. Output signals were fed through a pulse-height discriminator to a 512-channel multiscaler with quartz-crystal clock control.

In most runs, the sample was counted for about 20 half-lives and the bombardment-count cycle repeated until ~ 10^5 events were recorded. These data were fitted with two-component decay curves in which the half-life of the longer-lived (background) component was held constant. This fixed value was determined for each target by analyzing the residual activity in one run performed

TABLE I. Experimental half-lives.

Parent nucleus	Present results (msec)	Previous results (msec)	Ref.
^{46}V	423.4 ± 2.0	424.0 ± 2.0	3
		425.9 ± 0.8	4
		425.3 ± 2.0	5
^{50}Mn	284.0 ± 0.4	304.0 ± 5.0	6
		285.7 ± 0.6	4
		285.1 ± 0.9	5
^{54}Co	193.4 ± 0.4	194.0 ± 2.0	6
		193.7 ± 1.0	4
		193.1 ± 0.8	5
		193.0 ± 0.3	7

with a longer count time of 40 half-lives. With the ^{50}Cr and ^{54}Fe targets the background was determined to be ~ 0.2% of the principal activity at the start of the counting period, while for the ^{46}Ti target it was about 0.6%.

Between seven and fifteen runs were made for each target under a variety of experimental conditions. The overall rate at the beginning of each counting period was varied between 2000 and 10 000 counts/sec by changing the beam current from run to run. The β-energy threshold, controlled by the discriminator setting, was also varied to give initial multiscaler counting rates that ranged from 500 to 4000 counts/sec. The half-lives measured in these individual runs showed no significant systematic changes (confidence level > 15%) as determined for each target by a χ^2 test.

The system was also tested off-line for rate-dependent effects by using two radioactive sources observed separately and in conjunction. The source positions were chosen to give gross rates from each source of 4000 counts/sec, and measurements were made at discriminator settings corresponding to multiscaler rates of between 400 and 2000 counts/sec. The overall system losses at the highest multiscaler rate (4000 counts/sec for the combined sources) were measured to be ~ 0.4%, which would correspond to ~ + 0.1% error in a lifetime measurement. At the lower rates generally used in our actual measurements the error should be considerably less, and hence negligible with respect to the statistical uncertainty.

The weighted averages of all our half-life results are shown in Table I. The statistical uncertainties actually derived from the two-component fits already described are in fact smaller than those quoted. We have attempted to account for other possibly undetected background components by increasing the quoted uncertainties for ^{50}Mn and ^{54}Co by a factor of 1.5, and by 2.0 for ^{46}V where the total background was relatively larger.

It is evident from Table I that there is general agreement between the present results and those obtained by others[3-7] for both ^{46}V and ^{54}Co but not for ^{50}Mn. In that case our value, which has the smallest uncertainty, differs from two previously measured values—one unpublished[6] and the other for which few experimental details are available[4]—by several of their standard deviations. In Table II are listed the average lifetimes for all three nuclei together with the end-point energies measured in Ref. 2; the resultant ft values and corrected $\mathfrak{F}t$ values are also shown. The uncer-

TABLE II. Calculated ft values for superallowed decay branches.

Parent nucleus	E_β max[a] (keV)	$t_{1/2}$ (msec)	ft[b] (sec)	$\mathfrak{F}t$[c] (sec)
^{46}V	6018.8 ± 2.8	425.4 ± 0.7[d]	3043 ± 8	3088 ± 8
^{50}Mn	6607.8 ± 2.1	284.7 ± 0.8[d]	3053 ± 10	3098 ± 10
		284.0 ± 0.4[e]	3046 ± 6	3091 ± 6
^{54}Co	7220.5 ± 3.1	193.2 ± 0.2[d]	3046 ± 7	3089 ± 7

[a]Results from Ref. 2.

[b]Partial half-lives include a correction for electron capture. Values of f were computed from the decay energies according to the procedure described by Towner and Hardy (Ref. 1).

[c]Values of $\mathfrak{F}t$ differ from ft by the inclusion of calculated radiative corrections and charge-dependent effects (Ref. 2).

[d]Weighted averages of values shown in Table I.

[e]Present measurement only.

tainty quoted for ^{50}Mn reflects the fact that the four lifetime measurements are statistically inconsistent, so we have also computed the ft value for ^{50}Mn using our present measurement alone.

Evidently the new ^{50}Mn half-life brings its $\mathcal{F}t$ value into good agreement with ^{46}V and ^{54}Co. At the same time, all three values now agree well with the other superallowed transitions illustrated in Ref. 2 (the ^{12}C decay has also been determined recently with comparable accuracy[8]). The weighted average of all ten accurately measured transitions is $\mathcal{F}t = 3083.8 \pm 1.7$ sec; the normalized χ^2 is 1.3, which corresponds to a 25% confidence level. As such, this is in complete agreement with the predictions of CVC theory.

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ERRATUM

PRELIMINARY RESULT OF FRASCATI (ADONE) ON THE NATURE OF A NEW 3.1-GeV PARTICLE PRODUCED IN e^+e^- ANNIHILATION. C. Bacci, R. Baldini Celio, M. Bernardini, G. Capon, R. Del Fabbro, M. Grilli, E. Iarocci, L. Jones, M. Locci, C. Mencuccini, G. P. Murtas, G. Penso, G. Salvini, M. Spano, M. Spinetti, B. Stella, V. Valente, B. Bartoli, D. Bisello, B. Esposito, F. Felicetti, P. Monacelli, M. Nigro, L. Paoluzi, I. Peruzzi, G. Piano Mortari, M. Piccolo, F. Ronga, F. Sebastiani, L. Trasatti, F. Vanoli, G. Barbarino, G. Barbiellini, C. Bemporad, R. Biancastelli, M. Calvetti, M. Castellano, F. Cevenini, F. Costantini, P. Lariccia, S. Patricelli, P. Parascandalo, E. Sassi, C. Spencer, L. Tortora, U. Troya, and S. Vitale [Phys. Rev. Lett. 33, 1408 (1974)].

The names of L. Jones and G. Salvini were omitted from the Gamma-Gamma Group, and the names of M. Castellano and S. Patricelli were omitted from the Baryon-Antibaryon Group. Also, the names of R. Baldini Celio, M. Bernardini, G. Capon, L. Paoluzi, G. Piano Mortari, and M. Calvetti were misspelled, and M. Spinetti was given two spurious additional initials.

The byline addresses were incomplete. The members of the Gamma-Gamma Group are also at Istituto di Fisica dell'Università di Roma, Rome, Italy, and Istituto Nazionale di Fisica Nucleare, Sezione di Roma, Italy. The members of the Magnet Experiment for ADONE Group are also at Istituto di Fisica dell'Università di Napoli, Naples, Italy, and Istituto Nazionale di Fisica Nucleare, Sezione di Napoli, Italy, and Istituto di Fisica dell'Università di Roma, Rome, Italy, and Istituto Nazionale di Fisica Nucleare, Sezione di Roma, Italy. The members of the Baryon-Antibaryon Group are also at Istituto di Fisica dell'Università di Napoli, Naples, Italy, and Istituto Nazionale di Fisica Nucleare, Sezione di Napoli, Italy, and Istituto di Fisica dell'Università di Pisa, Pisa, Italy, and Istituto Nazionale di Fisica Nucleare, Sezione di Pisa, Italy, and Istituto Superiore di Sanità, Rome, Italy, and Istituto Nazionale di Fisica Nucleare, Sezione Sanità, Rome, Italy.

On page 1409, first column, line 5 should read "1.0-MeV steps" instead of "0.5-MeV steps." On page 1409, second column, line 13 should read "120 and 130 MeV" instead of "120 and 180 MeV/c." On page 1410, first column, the equation should be replaced by

$$2\Gamma_{ee}^2/\Gamma_{tot} = 0.8 \pm 0.2 \text{ keV}.$$