while at position B the field was measured with greater precision and this uncertainty was reduced to 0.013 radian. Uncertainties in the alignment of the polarization analyzer were less than 0.01 radian.

Combining the two runs, the value of the electric dipole moment of the muon is found to be (in units of $e\hbar/mc$)

$$f = 0.006 \pm 0.005.$$

This corresponds to a unit charge multiplied by a distance of $(1.1 \pm 0.9) \times 10^{-15}$cm. The result is consistent with a vanishing dipole moment expected on the basis of time-reversal invariance.

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π^- SCATTERING AND DISPERSION RELATIONS*

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In a recent paper[1] by one of us, the discrepancy in the π^--p dispersion relation was discussed. Although the disagreement between experiment and theory is much smaller than Puppi and Stanghellini[2] believed, there was still evidence of some disagreement with at least one of the apparently accurate experimental results. We now report further work which very much weakens the evidence for disagreement.

In deducing the forward scattering amplitude from their results, Korenchenko and Zinov[3] used a least-squares fit of the form $A + B\cos\theta + C\cos^2\theta$ for the elastic scattering differential cross section; this gives the results at 307 and 333 Mev shown in Figs. 2 and 3 of reference 1. At these energies d waves could be important and we should fit with the form $A+B\cos\theta+C\cos^2\theta+D\cos^3\theta+E\cos^4\theta$. As the least center-of-mass angle measured is about 40°, this d-wave fit could give a forward scattering intensity $|f(0)|^2$ which differs appreciably from that given by the p-wave fit (i.e., $D=E=O$). Also, the error in $|f(0)|^2$ as deduced from the d-wave fit will in general be appreciably larger than the error in $|f(0)|^2$ deduced by the p-wave fit. This is because the errors in the observed $|f(\theta)|^2$ for the vew smallest values of θ are much more important in the d-wave fit than in the p-wave fit.

The d-wave fit (as given in reference 3) for 333 Mev gives the real part of the forward scattering amplitude $D_-^b = 0.08_{-0.08}^{+0.07}$ (nuclear units). The mean value lies close to the theoretical curve for coupling constant $f_1^2 = 0.08$ (Fig. 3 of reference 1); the experimental error is large. At 307 Mev the usual precedure gives $D_-^b = (-0.014 \pm 0.014)^{\frac{1}{2}}$ (nuclear units). This imaginary value, which occurs because the d-wave analysis gives a much reduced $|f(0)|^2$, is a warning about the accuracy of the experiment. We conclude that the 307- and 333-Mev results now do not show disagreement with the dispersion relation for $f_1^2 = 0.08$.

We have reexamined the elastic differential cross sections of Ashkin *et al.*[4] at 150, 170, 220 Mev to find the effect of a d-wave fit of the form $A+B\cos\theta+C\cos^2\theta+D\cos^3\theta$. (At these energies we do not expect the d-wave phase shifts to be so large that $E \neq 0$ is justified.) The least center-of-mass angles are around 37°. The results in nuclear units ($\hbar = c = \mu = 1$) are shown in Table I.

These changes in the experimental values of D_-^b are of the same order of magnitude as we would expect from the d-wave phase shifts given by Chew *et al.*[5] An important aspect of the new values of D_-^b at 150 and 170 Mev is their large errors. We suggest that the errors in the d-wave fit coefficient D should not be greater than the values we would expect for $|D|$ using the d-wave phase shifts of reference 5. The errors shown in the table obey this criterion.

Table I. Values of D_-^b.

	150 Mev	170 Mev	220 Mev
D_-^b quoted in reference 1.	0.26±0.01	0.22±0.015	-0.14±0.05
New value of D_-^b	0.29±0.03	0.20±0.05	$-0.135^{+0.070}_{-0.045}$
M value of d-wave fit	4.7	8.9	5.7

Plotting these new values of D_-^b at 150, 170, 220, 333 Mev on Fig. 3 of reference 1, we see that apart from 150 Mev they differ from the theoretical curve for $f_1^2=0.08$ by, at most, a little more than the standard error. The 150-Mev value differs by more than twice the standard error. The evidence for a violation of the $\pi^- - p$ dispersion relation is therefore weak. However we suggest that to make quite sure there is no discrepancy it is desirable to make further experiments[1] to determine:

(i) The exact value of the total cross-section $\sigma_-(\omega)$ at resonance, and more accurate values of $\sigma_-(\omega)$ at 90-150 Mev.

(ii) More exact values of D_-^b in the ranges 120-170 Mev, 150-330 Mev.

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CONJECTURE CONCERNING THE PROPERTIES OF NONRENORMALIZABLE FIELD THEORIES

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It is commonly assumed that it is impossible to perform calculations with a local nonrenormalizable field theory. Some authors[1] have therefore postulated that nonrenormalizable interactions cannot have physical significance. We propose to show by means of a mathematical model that such pessimism may be unwarranted.

Consider, for example, the propagator for a boson field. By use of a spectral representation this may be expressed as[2]

$$\Delta_F'(p^2) = \frac{1}{p^2+\mu^2-i\epsilon} + \int_{m_0^2}^{\infty} \frac{dm^2 \rho(m^2)}{p^2+m^2-i\epsilon}. \qquad (1)$$

The spectral density function can be computed by use of perturbation theory for either a renormalizable theory or a nonrenormalizable theory. For a renormalizable theory there will be contributions to $\rho(m^2)$ having an asymptotic behavior for large m^2 as $1/m^2$, $(1/m^2)\ln m^2$, $(1/m^2)\times(\ln m^2)^2$, etc. When such contributions are substituted into Eq. (1), they yield finite results.

For a typical nonrenormalizable theory one finds for $\rho(m^2)$ a series of terms that behave asymptotically as 1, m^2, m^4, etc. When terms having this behavior are substituted into Eq. (1), the integrals encountered do not exist and because of this either such theories have been abandoned or cutoff functions have been introduced.

We shall now exhibit two functions whose power-series expansions (in g^2) have just the properties we have described. It is our point of view that these functions are to be considered as mathematical models for the exact propagators of the two kinds of field theories we have