$$\sum_{\varkappa, M} (-)^{M-K} C^{\varkappa 0}_{I-MIM} C^{\varkappa 0}_{I-KIK} D^{\varkappa}_{00}(\omega) = 1, \quad (8)$$

hence,

$$\sigma_s^{IK}(\theta) = \frac{2}{\pi}\frac{(kb)^4}{k^2}\int_0^1 d\mu \xi^2(\mu) \int_0^{\frac{\pi}{2}} d\varphi \left[\frac{J_1(t)}{t}\right]^2 = \sigma_s(\theta). \quad (9)$$

Thus, the differential scattering cross section $\sigma_s(\theta)$ does not depend on the initial state of the nucleus, i.e., on the index I, K. Graphs of the function $\sigma_s(\theta)$ for different degrees of nuclear deformation and different neutron energies have been published[1].

The integrated cross section $\sigma_s = \int d\Omega \sigma_s(\theta)$, does not depend on the energy (in agreement with the results of Ref. 1) and has the form

$$\sigma_s = \pi b^2 \int_0^1 d\mu \xi(\mu).$$

The dependence of σ_s on the degree of nuclear deformation was considered in Ref. 1.

The total cross section for all scattering processes is specified by the imaginary part of the amplitude for elastic scattering evaluated at $\theta=0$, i.e.,

$$\sigma_t^{IK} = \frac{4\pi}{K}\frac{1}{2I+1}\sum_M \operatorname{Im} f^{IMK}_{IMK}(\Omega)\Big|_{\theta=0}.$$

This reduces with the use of Eq. (5) to the total cross section $\sigma_t^{IK} = \sigma_t = 2\pi b^2 \int_0^1 d\mu\xi(\mu) = 2\sigma_s$. The cross section for capture is $\sigma_c = \sigma_t = \sigma_s = \dot{\sigma}_s$. Thus, the total neutron scattering cross section and absorption cross section do not depend on the initial state of the nucleus either.

It is easy to see that for the case of spherical nuclei the above formulas reduce to the formulas given by the diffraction of neutrons by "black" spherical nuclei.

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* Because of the reflection symmetry of the nucleus, the wave function (3) has to be symmetrized correspondingly[2]. However, for our purposes we can use the nonsymmetric expression.

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Concerning the Radiative Correction to the μ-Meson Magnetic Moment

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ANALYSIS of the structure of the present quantum theory of fields indicates its inapplicability to distances of the order of $\hbar/\lambda_0 \sim 10^{-13} - 10^{-14}$ cm[1]. Consequently, for those quantum-electrodynamic processes where momenta (real or virtual) of the order of λ_0 play a role, deviations from the usual formulas are to be expected. For the evaluation of these deviations in the integrals which appear in the determination of radiative corrections (integrals over virtual momenta) one can restrict the upper limit of integration to λ_0. Since these integrals converge for momenta $\sim m$, then the deviations should be of the order of m^2/λ_0^2, where m is the mass of the charged particle. This is why the deviations for the magnetic moment of the electron appear only in the third order radiative correction, viz., α^3 ($\alpha = e^2/\hbar c$)[2]. In the case of the heavier μ-meson, the finiteness of λ_0 affects the first radiation correction ($\sim \alpha$) and one expects a different value than predicted by Schwinger's formula. If one assumes that the μ-meson is devoid of any specific interactions which are greater than the electromagnetic one, then the problem can be treated as one in pure electrodynamics.

For the determination of the magnitude of the change in the radiative correction to the magnetic moment of the μ-meson (a change which is dependent upon the finiteness of λ_0) we shall consider, as is customary[3,4], the vertex portion of the scattering matrix of the third order Λ_i. The linear term of its expansion in wave vectors of the external field $q/\hbar$ has the following form [$\hat{q} = q_\alpha \gamma_\alpha$; $q \simeq (q; iq_0)$]:

$$\Lambda_i = (\pi^2/2m) F (\gamma_i \hat{q} - \hat{q}\gamma_i). \quad (1)$$

The coefficient F serves to specify the radiative correction to the magnetic moment, i.e.,

$$\Delta\mu/\mu = (\alpha/2\pi) F. \quad (2)$$

For $|\lambda_0| = \infty$, we have $F = 1$, and Eq. (2) is just the Schwinger formula. For finite λ_0, we can write $F = 1 - \delta F(\lambda_0)$, and hence

$$\Delta\mu/\mu = (\alpha/2\pi)[1 - \delta F(\lambda_0)]. \quad (3)$$

F is expressed by integrals in momentum space of the form

$$J = \int \frac{d^4k\,[1; k_\sigma; k_\sigma k_\tau]}{(k^2 - 2p_1k)(k^2 - 2p_2k)k^2}$$

(p_1 and p_2 are the initial and final momenta of the meson and $p_2 - p_1 = q$). Instead of integrating over a finite region one can retain the infinite integration limits and introduce Feynman's[3] truncating factor $\lambda_0^2/\lambda_0^2 + k^2$. Then

$$J(\lambda_0) = J(\infty) - \delta J(\lambda_0),$$

where

$$\delta J(\lambda_0) = \int \frac{d^4k\,[1; k_\sigma; k_\sigma k_\tau]}{(k^2 - 2p_1k)(k^2 - 2p_2k)(k^2 + \lambda^2)}.$$

Continuing the calculation in the usual manner[3,4], we obtain for the apex the following expression

$$\Lambda_i(\lambda_0) = \Lambda_i(\infty) - \delta\Lambda_i(\lambda_0);$$

$$\delta\Lambda_i(\lambda_0) = \int_0^1 2x\,dx \int_0^1 dy\, \{(1 - y - xy)\hat{q}\gamma_i - (1 - x + xy)\gamma_i\hat{q}\} \times \frac{\pi^2 m x}{x^2 p_y^2 - (1-x)\lambda_0^2}, \quad (4)$$

where

$$p_y = yp_1 + (1-y)p_2.$$

Let us first perform the integration over y. Since we are only interested in terms linear in q, we can substitute $p^2 = -m^2$ for p_y^2 in the integrand. Then Eq. (4) assumes the form of Eq. (1), viz.,

$$\delta\Lambda_i = (\pi^2/2m)(\gamma_i\hat{q} - \hat{q}\gamma_i)\,\delta F(\lambda_0),$$

where

$$\delta F(\lambda_0) = 2\int_0^1 \frac{(1-x)x^2}{x^2 + (\lambda_0/m)^2(1-x)}\,dx \quad (5)$$

$$= 1 + 2\gamma - \gamma(\gamma + 2)\ln\frac{1}{\gamma} - \frac{\gamma^2 + 4\gamma + 2}{\sqrt{1 + 4/\gamma}} \ln \frac{1 + \sqrt{1 + 4/\gamma}}{1 - \sqrt{1 + 4/\gamma}}$$

($\gamma = \lambda_0^2/m^2$). With $\gamma \gg 1$, the value of the integral is

$$\delta F(\lambda_0) = 2m^2/3\lambda_0^2. \quad (6)$$

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Charged Particle Green's Function in the "Infrared Catastrophe" Region

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In the electrodynamics of the electron Abrikosov[1] has shown that the interaction with the electric field leads to the appearance in the Green's function of the electron in the infrared region ($|p^2 - m^2| \ll m^2$) of the additional singularity

$$\left(\frac{m^2}{p^2 - m^2}\right)^{(e^2/2\pi)[3 - d_l(0)]} \quad (1)$$

as compared with the simple pole for the Green's function of the free electron. An analogous investigation in the electrodynamics of spin zero[2]