$$W_4 = -\frac{\alpha}{8\pi}\frac{g^2_{\pi NN}}{s}\frac{t}{(t - m^2_\pi)^2}F^2_\pi$$

where

$$F_1^v = F_1^p - F_1^n\ ,\quad F_1 = \left(G_E + \frac{k^2}{4m^2}G_M\right)/(1 + k^2/4m^2).$$

We see from these formulas that the cross section for the production of pions by longitudinally polarized photons is determined by F^2_π, whereas the cross section for the absorption of unpolarized transverse photons W_1 is sensitive to the contribution of the charge form factor of the nucleon. The quantities W_2 and W_3 are determined by the product of $F_1{}^VF$ and F^2_π, and a verification of the relation $2W_1 = \sqrt{s}W_3$ can serve as a criterion for the validity of the model.

Thus, the proposed reaction makes it possible to determine not only the absolute values of the form factors F_π and F_1^V, but also their relative sign. The latter is particularly important for the determination of the relative sign of the neutron electric form factor G_E^n at large k^2.

In conclusion, the author thanks M.P. Rekalo, at whose initiative this work was undertaken.

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ARGAND DIAGRAMS FOR THE QUASIPOTENTIAL AMPLITUDE OF pp AND $\bar{p}$p SCATTERING

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As is well known, the Regge asymptotic amplitude approximated in the low-energy region gives rise to spirals, called Schmid loops, on the Argand diagram [1]. It is also known that to describe data on scattering at high energies it is necessary to take into account, besides the Regge poles, also the contribution from the cuts in the I-plane, which naturally affects the behavior of the partial amplitudes at low energies. Such an influence of the cuts was investigated in [2] within the framework of the eikonal model.

In the present paper we consider Argand diagrams for the quasipotantial scattering amplitude. The quasipotential equation [3] is more general than the eikonal approximation and is valid at high and at low energies, so that it becomes possible to explain the resonant nature of the Schmid spirals.

In the simplest case of scattering of two spinless particles with equal mass, the quasipotential equation is

$$A(\mathbf{p},\mathbf{k}) = V(\mathbf{p},\mathbf{k}) + \int\frac{d\mathbf{q}V(\mathbf{p},\mathbf{q})A(\mathbf{q},\mathbf{k})}{\sqrt{m^2 + \mathbf{q}^2}\,(\mathbf{q}^2 - \mathbf{p}^2 - i0)}\ , \tag{1}$$

where $\vec{p}$, $\vec{k}$, and $\vec{q}$ are the c.m.s. momenta of the particles of the initial, final, and intermediate states.

Let us expand the amplitude and quasipotential in partial waves and integrate over the angles in (1). Then the integral equation for the partial amplitude takes the form

$$a_\ell(p,k) = v_\ell(p,k) + 4\pi \int_0^1 \frac{q^2 dq}{\sqrt{m^2+q^2}} \frac{v_\ell(p,q) a_\ell(q,k)}{q^2 - p^2 - i0} . \qquad (2)$$

Neglecting in [2] the principal value of the integral and going over to the mass shell, we obtain the following expression for the partial amplitude and invariant variables

$$a_\ell(s) = 32\pi^3 \frac{v_\ell(s)}{1 - i\frac{2\pi^2 p}{E} v_\ell(s)} . \qquad (3)$$

We note that in the present approximation the expression for the partial amplitude coincides with the expression obtained in the K-matrix representation [4].

We now use the quasipotential equation to describe elastic NN-scattering processes. To this end, we take into account in the quasipotential the exchange of the pomeranchon and the Regge poles (P', ρ, ω, H_2). The contribution of the Pomeranchuk pole is chosen in the form proposed in [5]. Taking the exchange degeneracy into account, we write the quasipotential for pp and $\bar{p}$p scattering in the form

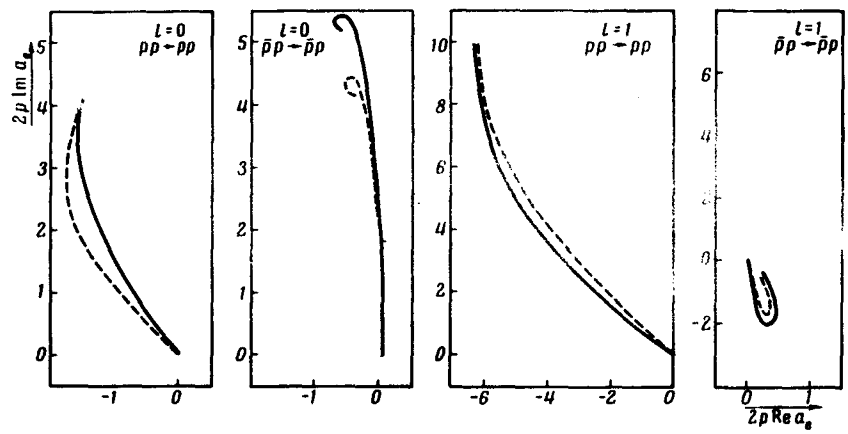
$$V_{pp} = i g_1 s\, e^{\gamma_1 t} [\beta(s)]^{\frac{\beta' t}{2}} - g_2 e^{\gamma_2 t} s^{-\frac{1}{2} + \beta' t} , \qquad (4)$$

$$V_{\bar{p}p} = i g_1 s\, e^{\gamma_1 t} [\beta(s)]^{\frac{\beta' t}{2}} + i g_2 e^{(\gamma_2 - i\pi\beta')t} s^{-\frac{1}{2} + \beta' t} , \qquad (5)$$

where

$$\beta(s) = \beta' s_1 \operatorname{arctg} \frac{s}{s_1} .$$

Such a choice of the quasipotential makes it possible to describe [5] data on the slope of the diffraction cone (the cone for pp scattering narrows down



Argand diagrams for the lower partial amplitudes of pp and $\bar{p}$p scattering. The dashed lines correspond to the case when the pomeranchon is a standing pole.

in the region $s < s_1 \simeq 200\ (\mathrm{GeV}/c)^2$ and ceases to narrow down at higher energies [6]).

We substitute the partial-wave projection of the quasipotential (4, 5) in (3) and continue the asymptotic expression for the partial amplitudes into the region of low energies. The figure shows the behavior of the lower partial wave (the parameters are taken from [5]).

We present also the partial amplitudes in the case when the pomeranchon is a standing pole. In our case this corresponds to continuation into the region of low energies from the asymptotic region $s > s_1$.

It is seen from the figure that the model under consideration, while ensuring narrowing of the cone at $s < s_1$, does not lead, in contrast to [7], to the appearance of loops on the Argand diagrams for pp scattering.

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ELECTROMAGNETIC POLARIZABILITY OF THE PION

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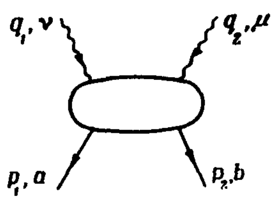
The possibility of experimentally measuring the electro-magnetic polarizability of the pion by determining the level shift in π-mesic atoms was pointed out recently in a number of papers [1, 2]. In the present paper we obtain the theoretical value of the polarizability within the framework of the low-energy π-meson technique.

The electromagnetic polarizability k_e determines the dipole moment $\vec{d} = 2k_e\vec{E}$ of the meson in an external electric field, and leads to an interaction energy in the form

$$H_{int} = -k_e E^2. \tag{1}$$

To calculate k_e, we consider the Compton effect on the pion at low energies. The notation for the momenta is shown in the figure (ν and μ are the polarization indices of the photons and a and b are the isotopic indices of the mesons).



We assume, as is customary in the low-energy technique, that it is possible to expand in powers of the momentum in the non-pole terms of the amplitude of the process in the figure. It follows then from the gauge invariance (the Ward identity) that, accurate to second order in the momenta, the amplitudes of the Compton effect for real quanta is given by