however, we see that the precession frequency in a constant field is equal to the difference of the frequencies at $m_2 = 1$ and $m_2 = 2$.

To demonstrate the absence of resonance singularities at small γ_0/β_{10} and arbitrary values of γ_1/β_{10} and ω/β_{10}, it is convenient to seek an approximate solution of (4) in the form

$$Z_n(t) = a_n + b_n \cos \omega t + c_n \sin \omega t. \tag{8}$$

Such a solution leads to the following expression

$$\operatorname{Im} \Delta L_{m_2} = -\beta_{10}^{-1} \frac{\frac{1}{2}(m_2\zeta)^2 m_2 \xi \left[3 + \theta^2 + \frac{1}{2}(m_2\zeta)^2 - (m_2\xi)^2\right]}{\left[1 + \theta^2 + \frac{1}{2}(m_2\zeta)^2 - 3(m_2\xi)^2\right]^2 + (m_2\xi)^2\left[3 + \theta^2 + \frac{1}{2}(m_2\zeta)^2 - (m_2\xi)^2\right]^2}. \tag{9}$$

As seen from (11), at small values of ξ (corresponding to $\alpha = H/H_0 < 1$ of [5]) the frequency dependence of the effect has a monotonic character and corresponds to the analogous dependence observed in [6] for $\xi = 0$. At large ξ ($\alpha > 1$), resonant singularities should be observed in the frequency dependence. It should be noted that one of the resonance conditions in (11) predicts the presence of a maximum in the region of frequencies larger than double the precession frequency in a constant field. From the same expression we can obtain a dependence of the amplitude of the effects on ζ (β in [5]) which agrees with tht experimental data of [5].

Thus, the solution (11) yields a relation that explains qualitatively the behavior of the effect at arbitrary ξ and ζ.

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VERIFICATION OF MODELS OF THE ASYMPTOTIC BEHAVIOR OF $\pi^{\pm}p$ SCATTERING AMPLITUDES

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The experimental data on the total cross sections of $\pi^{\pm}p$ scattering above 20 GeV [1] (it is assumed that $\sigma(\pi^+p) = \sigma(\pi^-n)$) do not agree with the extrapolation of the parametrizations at lower energies, obtained on the basis of a sum of several Regge poles [2]. Recently proposed models make it possible to parametrize the new data well, but require the presence of either Regge cuts [3] or of terms that violate the Pomeranchuk theorem [4 - 6]. Consequently the theoretical description of $\pi^{\pm}p$ scattering at high energies is presently subject to a great degree of ambiguity. We show in the present paper that by using a simple sum rule, which we have previously used for the case of $K^{\pm}p$ scattering [7], we can limit greatly the number of different parametrizations.

Let $F_{\pm}(\omega)$ be the amplitudes of the forward $\pi^{\pm}p$ scattering in the laboratory frame and satisfy the optical theorem

$$\sigma_{\pm}(\omega) = 4\pi \operatorname{Im} F_{\pm}(\omega)/k,$$

where $\omega^2 = k^2 + m_{\pi}^2$. Using the well-known properties of analyticity and crossing symmetry of the amplitudes and applying the Cauchy theorem to $F_{-}(\omega)$ along a closed contour consisting of the straight-line segment $-W + i\varepsilon \leq \omega \leq W + i\varepsilon$ $(\varepsilon \to 0^{+})$ and the semicircle $S(W)$, where $\omega = W \exp(i\phi)$, $0 \leq \phi \leq \pi$, we can obtain the sum rule

$$\frac{1}{4\pi} \int_{m_{\pi}}^{W} k[\sigma_{-}(\omega) - \sigma_{+}(\omega)]\, d\omega - 0.017\, g_N^2 = R(W), \tag{1}$$

where g_N^2 is the πNN coupling constant, and

$$R(W) = -\operatorname{Im} \int_{S(W)} F_{-}(\omega)\, d\omega. \tag{2}$$

For $W \leq 65$ GeV, the integral in (1) can be calculated on the basis of the experimental data on $\sigma_{\pm}$ [1, 8]. The contribution of the pole term in (1) is negligibly small. From (2) there follows a definite prediction of the values of $R(W)$ for each considered model of $F_{\pm}(\omega)$ for $|\omega| \geq W$. The table shows the comparison of the values of $R(W)$ (in natural units) with the values of the left-hand side of (1) for four values of W and for different models. The degree of violation of the Pomeranchuk theorem in each model is characterized by the predicted difference between the asymptotic cross sections $\Delta\sigma \equiv \sigma_{-}(\infty) - \sigma_{+}(\infty)$. It is clear from the results given in the table that $R(W)$ is quite sensitive to the choice of the model. In particular, the sum rule is in good agreement (in contrast to the case of $K^{\pm}p$ scattering [7]) with the hypothesis [6] that the cross sections $\sigma_{\pm}$ reach their asymptotic limits $\sigma_{\pm}(\infty)$ already at 30 GeV. This hypothesis likewise gives good agreement with a certain parameter describing the

Reference	$\Delta\sigma$, mb	R, 10 GeV	R, 20 GeV	R, 30 GeV	R, 65 GeV
[2][1)]	0	25	75	137	451
[3][1)]	0	29	79	137	404
[4][1)]	2,0	33	124	258	1099
[5]	0.80 ± 0,36	23 ± 8	74 ± 24	144 ± 47	553 ± 183
[6][2)]	1,3 ± 0,3	-	-	120 ± 28	561 ± 130
Left side of eq. (1)		23,8 ± 0,1	75 ± 2	145 ± 13	580 ± 46

[1)] The errors of the parameters are not given.

[2)] The sum rule is not applicable in this case for $W < 30$ GeV.

asymptotic behavior of $F_{\pm}(\omega)$ and obtained by a model-independent method [9].

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ABSORPTION OF LIGHT BY AN INHOMOGENEOUS LASER PLASMA

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A very important part of the problem of obtaining high temperatures by focusing laser radiation on solid targets [1, 2] is the question of the reflection of the laser radiation by the heated surface. The point is that when laser pulses of duration $\tau < 10^{-8}$ sec and energy $\sim 10 - 100$ J are used, a plasma layer of thickness $a \approx 10^{-2} - 10^{-3}$ cm and density $N \approx 10^{19} - 10^{23}$ cm^{-3} is produced at the surface; this density is higher than the critical density for the neodymium-laser frequency ($\omega = 1.8 \times 10^{15}$ sec^{-1}, $N_{cr} = 10^{21}$ cm^{-3}). Since the electron temperature T of the plasma reaches several keV, the optical thickness of the plasma with respect to bremsstrahlung absorption turns out to be less than unity: $a\nu/c < 1$ (ν - collision frequency, c - speed of light). Therefore an appreciable fraction of the laser radiation is consumed in heating the plasma and is reflected from the critical point, returning to the focusing device. The energy reflection coefficient, according to measurements [3], reaches 60%. With further increase of temperature, this value should increase even more, if it is assumed that the absorption of the light is determined as before by the Coulomb collisions. In this connection, different nonlinear effects were considered, leading to an increase of the absorption coefficient.

In the present paper we discuss, within the framework of the linear theory, the possibility of increasing the coefficient of absorption of light by an inhomogeneous laser plasma. We have in mind here the well-known phenomenon of transformation of a surface p-polarized wave with frequency close to the plasma wave into potential electronic Langmuir oscillations [4 - 6]. Let the plasma be inhomogeneous along the z axis, so that the critical density is reached at $z = 0$ and $N(z) < N_{cr}$ at $z < 0$. The xz plane of the rectangular coordinate system is chosen as the plane of incidence of the light wave. We emphasize that the transformation is possible only in the case of an obliquely incident p-polarized wave, when the angle θ between the wave vector k and the z axis differs from zero. The electric field E lies in this case in the plane of incidence, and the magnetic field B has a single component B_y perpendicular to the plane of incidence. The gist of the transformation of the light into a Langmuir oscillation of an inhomogeneous plasma consists of a sharp increase of the longitudinal component of the field E_z in the critical-density region $z \approx 0$, with a smoother variation of E_x and B_y. The transformation is a non-dissipative process. The transformation coefficient, and consequently also the coefficient