[2] A. N. Winchell and H. Winchell, Microscopical Characters of Artificial Inorganic Solid Substances: Optical Properties of Artificial Minerals, Academic, 1964 (Russ. transl., Mir, 1967, p. 209).
[3] L. M. Belyaev, A. B. Gil'varg, and G. F. Dobzhanskii, Scintillators and Scintillating materials, Proc. of Second Coordinate Conference on Scintillators in 1957. Published by Research Institute of Chemical Reagents (VNII khim. reaktivov), M., 1960, p. 10.

DECAY AND THE VENEZIANO MODEL

S. G. Matinyan and L. I. Kharbediya
Physics Institute, Georgian Academy of Sciences
Submitted 14 July 1969
ZhETF Pis. Red. 10, No. 6, 265 - 266 (20 September 1969)

Recently, the Veneziano formula [1] for the crossing-symmetry amplitude, the Regge behavior of which in all three channels is generated by an infinite system of equidistant pole-resonances with linear trajectories, has gained great popularity. The Veneziano amplitude claims to describe hadron processes in the entire Mandelstam plane, and particularly in the decay region, where all three variables s, t, and u are positive. Lovelace [2] and many others [3 - 5] have shown that the Veneziano formula describes a number of decay processes fairly well.

In this paper we consider ω decay into three pions in the same model.

The amplitude of the ω meson decay is given away

$$\epsilon^{abc}\,\epsilon_{\mu\nu\rho\sigma}\,e_\mu\,p_\nu^{(a)}p_\rho^{(b)}p_\sigma^{(c)}A(s,t)\,,$$
$$A(s,t) = B(s,t) + B(t,u) + B(u,s)\,, \tag{1}$$

where e_μ is the polarization vector of the ω meson, p are the pion momenta,

$$B(x,y) = \beta\frac{\Gamma(1-a(x))\,\Gamma(1-a(y))}{\Gamma(2-a(x)-a(y))}\,,$$

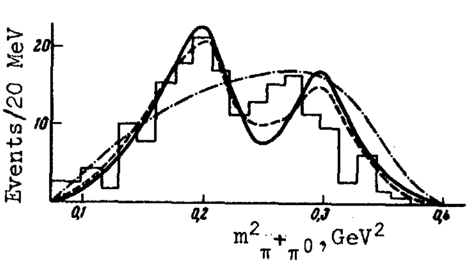
and β is independent of s, t, or u. The ρ-meson trajectory is α(s) = 0.48 + 0.88 s. β can be expressed in terms of the constants $g_{\omega\rho\pi}$ and $g_{\rho\pi\pi}$, of the $\omega\to\rho\pi$ and $\rho-\pi\pi$ transitions which are used in the ω-decay model [6]. A simple comparison yields $\beta = \alpha' g_{\omega\rho\pi}g_{\rho\pi\pi}$.

This relation leads, as shown also in [5], to a correct value of the total width of the ω meson (11 - 12 MeV, depending on the choice of the width of the ρ meson and the constant $g_{\omega\rho\pi} = 17 - 20\ \mathrm{GeV}^{-1}$).

The figure shows the distribution with respect to the square of the mass of the $\pi^+\pi^0$ system in ω decay (solid curve), which follows from the Veneziano formula (1). For comparison, the figure shows also the curve corresponding to the "crossing-symmetry Breit-Wigner model"

$$A(s,t) = (1/1-a(s)) + (1/1-a(t)) + (1/1-a(u))$$

(dashed curve), and the curve corresponding to A(s, t) = const (dash-dot curve). The histogram was taken from [7]. The curves are normalized to equal areas.



The authors are grateful to O. V. Kancheli for

useful discussions.

[1] G. Veneziano, Nuovo Cimento, 57 A, 190 (1968).
[2] C. Lovelace, Phys. Lett. 28B, 264 (1968).
[3] R. Jengo and E. Remiddi, CERN preprint Th. 989 (1969).
[4] J. Baacke, M. Javob, and S. Pokorski, CERN preprint Th. 983 (1969).
[5] H. Goldberg and Y. Srivastava, Phys. Rev. Lett. 22, 749 (1969).
[6] M. Gell-Mann, W. Wagner, and D. Sharp, Phys. Rev. Lett. 8, 261 (1962).
[7] M. Meer et al. 1962 International Conference on High-Energy Physics, Proceedings, p. 103 (1962).

CONDUCTIVITY OF SEMICONDUCTORS UNDER PINCH-EFFECT CONDITIONS

L. V. Keldysh and M. G. Pkhakadze
P. N. Lebedev Physics Institute, USSR Academy of Sciences; Physics Institute, Georgian Academy of Sciences

Submitted 20 July 1969
ZhETF Pis. Red. 10, No. 6, 267 - 270 (20 September 1969)

We shall derive in this paper the current-voltage characteristics of semiconductors in the presence of the pinch effect, as functions of different carrier-scattering mechanisms.

The equation describing the contraction of an electron-hole plasma, assuming $n_e \approx n_h = n \gg N_i$, has in cylindrical coordinates the form [1]

$$\frac{dn}{dr} + \frac{4\pi e}{c^2} E_z^2 \frac{\mu_e \mu_h (\mu_e + \mu_h)}{D_e \mu_h + D_h \mu_e} \frac{n}{r} \int_0^r n(\mu_e + \mu_h) r' dr' - \frac{\mu_e + \mu_h}{D_e \mu_h + D_h \mu_e} \frac{1}{r} \int_0^r (P - g) r' dr' = 0 . \quad (1)$$

Here n is the electron or hole density, N_i is the density of the charged impurities, e is the electron charge, c is the velocity of light, $\mu_{e,h}$ and $D_{e,h}$ are the mobilities and diffusion coefficients of the electrons and holes, E_z is the constant electric field, and P and g are the recombination and generation rates, respectively.

A strongly non-equilibrium plasma with $n \gg N_i$ can be obtained with the aid of two photon absorption or injection. We shall assume the recombination to be either linear in the concentration, $P = n/\tau$, where τ is the carrier lifetime, or else quadratic $P = \gamma n^2$.

To find the dependence of the current on the field it is necessary to find the function n(r) for the different scattering mechanisms that determine the electron and the hole mobilities. It is impossible to solve (1) in a general case. At low generation and recombination rates, the third term in (1) can be discarded when determining the n(r) dependence, but it must be taken into account in the determination of the average density $\bar{n}$. The conditions for the smallness of the third term of equation (1) in the case of linear and quadratic recombination are, respectively,

$$\tau \gg \frac{c^2}{4\pi e \mu_e \mu_h (\mu_e + \mu_h) E_z^2 \bar{n}}, \quad \gamma \ll \frac{4\pi e \mu_e \mu_h (\mu_e + \mu_h) E_z^2}{c^2}. \quad (2)$$

For InSb at $T \sim 100°K$, $\mu_e \sim 10^5$ cm^2/V-sec, $\mu_h \sim 10^4$ cm^2/V-sec, and $E_z \sim 100$ V/cm condition (2) assumes the form $\tau \gg 10^7/\bar{n}$ sec and $\gamma \ll 10^{-8}$cm^{3}sec^{-1}. If it is recognized that