take into account the scattering of the electrons by the impurities or the deviation of T from zero, and when T = 0 the scattering accompanied by absorption of optical phonons, which has a probability $\sim \exp(-\hbar\omega_0/k_B T)$ (k_B = Boltzmann's constant), can be less significant than scattering by acoustic phonons. By allowing for the deviation of T from zero or for the interaction of the electrons with additional scatterers, we find that $K(\omega)$ has a finite value in the second maximum, and that when H increases in the $\Omega_c > \omega_o$ side the second peak broadens and then disappears. The form of the peak is determined by the magnitude of the interaction with the additional scatterers and by the temperature.

Using for InSb typical values of the parameters used in the theory ($\hbar\omega_o$ = 0.02 eV, α_o = 0.02) we obtain the following: 1) the distance between the absorption-coefficient peaks at resonance (at λ = 0), $\hbar\Delta \approx 1.5 \times 10^{-3}$ eV [from (5)]; 2) the width of the first peak (at λ = 0), $\delta \approx 0.8 \times 10^{-3}$ eV [from (9)]; 3) the point where the first peak vanishes at $\Omega_c \approx 0.9\omega_0$ [from (6)]. These results agree well with the experimental data.

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*The influence of the electron-phonon interaction on the spectrum of an electron in a magnetic field was considered in [2], where it was found that $\Delta \sim \alpha_o^{1/2}$. The reason for the disparity between this result and (5) is, in our opinion, the omission of a factor from formula (3) of [2].

PHOTOPRODUCTION OF BOSONS ON NUCLEI WITH S = T = 0

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It is noted in [1] that when bosons and boson resonances are produced on nuclei with zero spin (S) and isospin (T) without excitation, only two classes of quantum numbers, vacuum and ω-meson, are exchanged. This circumstance can be used to study, at high energies, the singularities of the amplitudes of such reactions in the complex angular momentum plane. We have previously considered [2] a number of coherent processes of the type $\pi^\pm + Z \to a + Z$ and $K^\pm + Z \to b + Z$ (a, b - boson resonances with strangeness $|S|$ = 0, 1), and pointed out certain properties of such processes (see also [1]). In this note we discuss the characteristics of processes of the type $\gamma + Z \to a + Z$ (without excitation of a nucleus with S = T = 0), which can be predicted on the basis of parity and charge parity (C) conservation, relativistic invariance, and the Regge-pole model. Particularly suitable for the investigation [1] are He^4 nuclei, the excited state of which has a rather high energy, $\sim$ 20 MeV, and is unstable, thus contributing the separation of a coherent effect in experiments. In the case of the nuclei C^{12}, O^{16}, etc., the separation of the coherent effect is more complicated, but is possible if a thorough analysis of the kinematics is made [1]. Let us consider the simplest pseudoscalar-meson photoproduction reaction

$$\gamma + Z \to (\pi^0, \eta^0) + Z \qquad (1)$$

In the case of coherent productions, only quantum numbers of the ω-meson type ($S^{PG} = 1^{--}$) are transferred in the annihilation t-channel in such reactions. The amplitude of such reactions is proportional to $t \sim \vec{e}\cdot\vec{n}$, where $\vec{e}$ is the photon polarization vector and $\vec{n}$ the normal vector in the reaction plane. The characteristic features of the coherence of the reactions (1) become manifest in the following: at small production angles Θ_0, the differential cross section is $d\sigma/d\Omega \sim \sin^2 \Theta_0$ (at small angles $\Theta_0 \approx m^2 E_\ell^2$, a Coulomb peak is obtained in the lab. system, so that to separate strong interactions it is necessary to investigate larger angles; m is the meson mass); at small transverse of the 4-momentum squared t (beyond the limits of the Coulomb peak) $d\sigma/dt$ should decrease with increasing energy like $E^{2(\alpha_\omega - 1)}$ ($\alpha_\omega(0) \approx 0.5$) as $E \to \infty$, provided the ω-pole predominates in the complex angular momentum plane.

At intermediate energies, it is reasonable to take the φ-pole into account. In addition, $d\sigma/d\Omega \sim (1 - \xi_3)$, where ξ_3 is the Stokes parameter [3] characterizing the linear polarization of the photon in the reaction plane. When $\xi_3 = 1$ the reaction (1) does not take place at all, and when $\xi_3 = -1$ its cross section is maximal. The next class of reactions is the photoproduction of vector mesons:

$$\gamma + Z \to (\omega, \phi, \rho^\circ) + Z \tag{2}$$

If the process is coherent, then these reactions should proceed via exchange of states with vacuum quantum numbers. The spin structure of the amplitude of such a reaction contains three invariants in the general case and twelve invariants for nucleon targets. But in the region of small vector-meson ejection angles the amplitudes with helicity change are small, and the polarization state of the final meson is given by $(\vec{e}\cdot\vec{\varepsilon})$, where $\vec{e}$ and $\vec{\varepsilon}$ are the polarization vectors of the photon and the vector meson. At small production angles Θ_0 we have $d\sigma/d\Omega \sim$ const and $d\sigma/dt \sim E^{(2\alpha_p - 1)}$ ($\alpha_p(0) = 0$) as $E \to \infty$, etc. in the Regge-pole model. In the intermediate energy region it is necessary to take into account the vacuum p' pole. Let us consider the angular distributions of the vector-meson decay products in a system where they are at rest. For simplicity we assume that the photons are unpolarized. In the decays $\rho^0 \to 2\pi$ and $\phi \to K\bar{K}$, the pion angular distribution is $dW \sim \sin\Theta \, d\Omega$, where Θ is the angle between the momentum of the meson from the decay and the momentum of the γ quantum. In the $\omega \to 3\pi$ decay $dW \sim \sin^2 \Theta' d\Omega'$, where Θ' is the angle between the normal to the decay plane and the γ-quantum momentum. In ω decay via the $\omega^o \to \pi^o + \gamma$ channel, $dW \sim (1 + \cos^2\Theta) d\Omega$, where Θ is the angle between the momenta of the incoming γ quantum and one of the decay particles. The peculiarities of the photoproduction of axial mesons are somewhat different. At small production angles Θ_0, the spin structure of the amplitude is determined by the factor $\vec{k}\cdot\vec{\varepsilon}\times\vec{e}$, where $\vec{e}$ and $\vec{\varepsilon}$ are the photon and meson polarization vectors, and $\vec{k}$ is the photon momentum. A_1 -meson production (C-parity +1) involves exchange of states with the ω-meson quantum numbers. In the Regge-pole model $d\sigma/dt \sim E^{2(\alpha_\omega - 1)}$ as $E \to \infty$ and for small t. As $\Theta_0 \to 0$ we get $d\sigma/d\Omega \sim$ const. If a B-meson is produced (C = -1), exchange of vacuum states takes place. Therefore $d\sigma/dt \sim E^{2(\alpha_p - 1)}$ as $E \to \infty$. $d\sigma/d\Omega \sim$ const as $\Theta_0 \to 0$, just as in the A_1 case. The angular distribution in the decays $A_1 \to \rho\pi$ and $B \to \omega\pi$ is the same, $dW \sim (a + b \cos^2\Theta) d\Omega$, where Θ is the angle between the momenta of the photon and the decay pion, and a and b are constants. Let us proceed to consider the more complicated case of photoproduction of tensor mesons

$$\gamma + Z \rightarrow (f,\ A_2,\ f') + Z \qquad (3)$$

The spin structure of the amplitudes of reactions (2) reduces to five invariants in the general case and to 20 invariants for a nucleon target, but in the small production-angle region, only one invariant is left, by virtue of helicity conservation. In the system where the meson is at rest, the amplitude of reaction (3) is proportional to $\phi_{ab}\ \ell_a k_b$, where ϕ_{ab} is the wave function of the tensor meson, and ℓ_a and k_b are the photon polarization and momentum vectors. The reaction (3) proceeds via exchange of states with ω-meson quantum numbers. In the region of small Θ_0, we have $d\sigma/d\Omega \sim$ const and $d\sigma/dt \sim E^{(2\alpha_\omega - 1)}$ for small t and for $E \rightarrow \infty$, in accord with the Regge-pole model. The angular distribution of the pions from the $f \rightarrow 2\pi$ decay is given by $dW \sim \cos^2\Theta \sin^2\Theta\, d\Omega$, where Θ is the angle between the momenta of the photon and one of the pions. A similar distribution is obtained for the decays $A_2 \rightarrow \bar{K}K$ and $\eta\pi$ and $f \rightarrow \bar{K}K$. In the main decay $A_2 \rightarrow \rho\pi$ we get $dW \sim \cos^2\Theta\ (1 + \cos^2\Theta)d\Omega$. We see thus that in coherent photoproduction of boson resonances on nuclei, the picture of the angular distribution is much simpler than in photoproduction on nucleons. This gives grounds for hoping that such processes can be separated experimentally, and by the same token that the energy dependence of the amplitudes of reactions with f and ω-meson quantum numbers can be investigated at high energies. We regard the latter as rather important for checking and determining the limits of applicability of the Regge many-pole model [4].

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THE STRUCTURE OF THE GRAVITATIONAL LAGRANGIAN

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It can be asserted at present that the motion of Mercury contradicts Einstein's equations. This is the result of the quadrupole increment

$$\delta\phi = \frac{1}{2}\ Gmq\ (3\cos^2\theta - 1)\, r^{-3}$$

of the sun's gravitational field; here m and q are the mass and quadrupole moment of the sun ([q] is in cm^2, $q > 0$, θ is the angle between the plane of the orbit and the sun's axis of rotation, and G is Newton's constant. Allowance for $\delta\phi$ leads to the following value for the relativistic shift of the perihelion (per revolution): $\delta\alpha = \delta\alpha_0 - \delta\alpha_q$, where $\delta\alpha_q = 6\pi q/p^2$, and $\delta\alpha_0$ is the difference between the observed shift angle and its theoretical nonrelativistic value, calculated without allowance for $\delta\phi$. For Mercury $p = 5.4 \times 10^7$ km and $\delta\alpha_0 = (42.9 \pm 0.2)''$