trema. In addition, the longitudinal magnetoresistance in n-InSb has a deep minimum at 75 kOe [8]. These are apparently the reasons why we were not able to observe all the peaks due to two-phonon transitions.

It is thus clear from our results that the two-phonon processes make a definite contribution to the magnetoresistance of n-InSb.

The appearance of additional minima with increasing temperature was observed by Stradling and Wood [9] in an investigation of the longitudinal magnetoresistance of n-InAs and n-GaAs in constant magnetic fields up to 140 kOe, and was also attributed by them to two-phonon resonance transitions.

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SCATTERING ASYMMETRY AND POLARIZATION OF THE PHOTODISINTEGRATION PRODUCTS OF ^{4}He

Yu. M. Arkatov, P. I. Vatset, V. I. Voloshchuk, V. L. Marchenko*, A. F. Khodyachikh, and V. I. Chmil'
Physico-technical Institute, Ukrainian Academy of Sciences

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A study of the scattering asymmetry and polarization of photo-nuclear reaction products, together with their angular distributions, makes it possible to estimate in an independent manner the contributions of small electric and magnetic multipoles in γ-quantum absorption, to choose and refine the type of the nucleon-nucleon interaction potential, and to obtain information on the nuclear structure.

So far, experimental and theoretical studies of the asymmetry of scattering and polarization of photoproducts have been made on few nuclei [1 - 5]. There are no published theoretical calculations and experimental measurement data on the asymmetry of the scattering and polarization of the photodisintegration products of ^{4}He.

Preliminary measurement results on the asymmetry of the scattering and polarization were obtained for p and ^{3}H from the reaction

$$^4\mathrm{He} + \gamma \to p + {}^3\mathrm{H} \tag{1}$$

and for ^{3}He from the reaction

$$^4\mathrm{He} + \gamma \to n + {}^3\mathrm{He} \, . \tag{2}$$

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*Deceased

by means of a 300-MeV electron accelerator and a diffusion chamber [6] filled with ^{4}He to 10 atm pressure. The analyzer was the gas filling the chamber.

The 24000 stereo photographs obtained by γ-irradiation of the diffusion chamber contained 74 events of elastic scattering of p and 78 events of elastic scattering of ^{3}H from reaction (1), and also 42 events of elastic scattering of ^{3}He from reaction (2). As seen from Fig. 1, which shows a case of proton scattering from reaction (1), a study of the polarization with the aid of the chamber procedure makes it possible to select uniquely the pure events of elastic scattering by the investigated particles.

Table I lists the values of the total right-left scattering asymmetry.

To estimate the polarization we used the likelihood function

$$L(P) = \prod_{l}(1 + PP_l \cos \phi_l),$$

where P is the unknown polarization, P_1 the analyzing ability of ^{4}He, and ϕ_1 the angle between the production and scattering planes of the particle. The positive polarization direction was chosen to coincide with the direction of the vector product $\vec{K}_\gamma \times \vec{K}$, where $\vec{K}_\gamma$ is the momentum of the incident gamma quantum and $\vec{K}$ is the momentum of the produced particle.

The values of the polarization of p and ^{3}H from reaction (1) and of ^{3}He from reaction (2) are listed in Table II, where W is the reliability of the sign of the polarization. The reliability was determined by using the probability integral for the normal distribution. It follows from Fig. 2 that the L(P) distribution agrees well with the normal distribution, as was noted in [4]. The dispersion of P, calculated by the maximum-likelihood method,

Fig. 1. Elastic scattering of ^{4}He proton from the reaction (1).

Table I

Particle and E_γ, MeV $\theta_{\text{c.m.s.}}$ deg	p 25 – 40	^{3}H 22 – 60	^{3}He 27 – 64
10 – 90°	0.185 ± 0.172	– 0.228 ± 0.236	– 0.151 ± 0.215
90. – 170°	0.333 ± 0.245	–0.06 ± 0.245	–0.139 ± 0.295

Table II

Particle	θ c.m.s. deg. E_γ, MeV	10 – 90°	W	90 – 170°	W	10 – 170°
p	23 – 40	0,02 ± 0,05	—	– 0,23 ± 0,14	—	—
	23 – 27	—	—	—	—	– 0,05 ± 0,07
	27 – 40	—	—	—	—	0,10 ± 0,08
^{3}H	22 – 40	0,79 ± 3,3	59,5%	– 0,9 ± 2,7	63%	—
^{3}He	31 – 45	– 0,33 ±1,46	60,3%	–0,68 ± 1,74	65,2%	—

Note: E_γ – γ-quantum energy,
θ – polar angle

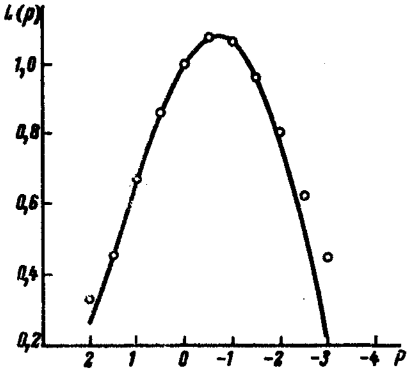

Fig. 2. Comparison of the likelihood-function distribution (curve) with the normal distribution $1.08 \exp[-\frac{1}{2}(P + 0.68)]$.

coincides with the mean-squared deviation of the chosen normal distribution. The fact that the maximum value of L(P) exceeds unity is the consequence of the low statistics and the large measurement errors.

The obtained data enable us to estimate the magnitude and sign of the total right-left scattering asymmetry of the investigated particles, the magnitude and the sign of the polarization of p from reaction (1), the sign of the polarization of ^3H from reaction (1), and also the sign of the polarization of ^3He from reaction (2).

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QUANTIZATION OF ELECTRON ENERGY NEAR A DOMAIN WALL

R. G. Mints
L. D. Landau Theoretical Physics Institute, USSR Academy of Sciences
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As is well known, a ferromagnet in the non-magnetized state is stratified into domains [1]. The saturation magnetic moment inside each domain equals $M_0 = M_0\ (T) \sim 10^2 - 10^3$ Oe. In the transition region between the domains, the magnetic-moment vector is rotated through an angle corresponding to the domain structure. The width of the transition region (the domain wall) is $\delta \sim 10^{-5} - 10^{-6}$ cm. The induction $\vec{B} = 4\pi\vec{M}$ is thus homogeneous inside the domain and inhomogeneous in the domain wall. In a ferromagnet, the induction field $\vec{B}$ plays the role of an external magnetic field relative to the conduction electrons. The characteristic size of the orbit in the homogeneous induction field $\vec{B}^0 = 4\pi\vec{M}_0$ is $R \sim 10^{-2} - 10^{-4}$ cm, i.e., $R \gg \delta$. This makes it possible to identify the conduction electrons by the character of their motion, in the following manner. One group of electrons moves without crossing the domain wall, i.e., in a homogeneous induction field. The other group (near the domain wall) crosses the region of the inhomogeneous induction field; these electrons "feel" the field $\vec{B}_1$ and the field $\vec{B}_2$ ($\vec{B}_1$ and $\vec{B}_2$ are the induction vectors in the neighboring domains).

We consider in this paper the quantization of the conduction-electron energy near the domain wall. We recall that the quantization of electron energy inside the domains is well known (Landau quantization) [2]. Of course, it is necessary here to satisfy the condition $\Omega\tau \gg 1$, where $\Omega = eB_0/mc$ is the cyclotron frequency and τ is the electron free-path time.

It is clear from the foregoing that the motion of electrons in a ferromagnet is determined by the domain structure, i.e., by the relative orientations of $\vec{B}_1$, $\vec{B}_2$, and the domain wall. The domain structure can be of one of two types: 1) The projections B_{1y} and B_{2y}, of the induction vectors $\vec{B}_1$ and $\vec{B}_2$ on the direction perpendicular to the domain