creases jumpwise by ~0.03 eV.

In addition, for SbSI in the ferroelectric region (just as for SbSBr and BiSBr in the paraelectric region), an appreciable kink in the temperature dependence of the width of the forbidden band E_g is observed at -43°C. Above t = -43°C, $dE_g/dT \simeq -30 \times 10^{-4}$ eV/deg (which agrees with the data of [4,5]), and below this temperature $dE_g/dT \simeq -12 \times 10^{-4}$ eV/deg. It is possible that a second-order phase transition takes place in this case.

The results shown in the figure not only confirm the existence of ferroelectric phase transitions in SbSBr, BiSBr, and SbSI at -180, -170, and +22°C respectively, but indicate unambiguously their character (first-order transitions). In addition to these transitions singularities in the temperature dependence of the width of the forbidden band are observed in the paraelectric region for SbSBr and BiSBr and in the ferroelectric region for SbSI. These are apparently evidence of the existence of second-order phase transitions in these crystals.

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SPIN MAGNETOPHONON AND MAGNETOPHONON OSCILLATIONS OF MAGNETORESISTANCE IN n-InAs

M. M. Aksel'rod and I. M. Tsidil'kovskii
Institute of Metal Physics, USSR Academy of Sciences

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We have shown earlier [1,2] theoretically and experimentally (for n-InSb) that inelastic resonant scattering of electrons by optical phonons with spin flip (spin-magnetophonon resonance - SMR) causes the appearance of oscillations of transverse and longitudinal magnetoresistance (ρ_{xx} and ρ_{zz}). The resonance condition is

$$\epsilon_{N,S} - \epsilon_{k,S'} = \hbar\omega_0, \quad S \neq S', \tag{1}$$

where $\epsilon_{N,S}$ is the energy of the N-th Landau level with the given value of spin, ω_0 is the limiting frequency of the optical phonon, and S, S' = 1/2. When S = S' Eq. (1) describes the conditions for magnetophonon resonance (MPR) [3].

The minimum of ρ_{zz} observed in n-InAs at ~160 kG [4,5] is connected either with SMR transitions $\epsilon_{0,-} \to \epsilon_{0,+}$, or else with combined transitions $\epsilon_{0,+} \to \epsilon_{1,-}$ [5]. In either case, the value of the g-factor at the bottom of the band, obtained with allowance for the nonparabolicity of the conduction band ($|g_0| = 30 - 40$) is in poor agreement with the theoretical value $|g_0| = 18$ calculated by the Roth formula [6]. Corresponding to this value of g_0 are fields ~500 kG.

The undertaken investigations of longitudinal magnetoresistance in single-crystal n-InAs with $n = 2.2 \times 10^{16}$ cm^{-3} at 300°K have shown that ρ_{zz} does indeed have a minimum located at 480 kG (Fig. 1). If it is assumed that this minimum is due to resonance transitions $\epsilon_{0,-} \to \epsilon_{0,+}$, then the value $|g_0| = 19$ obtained from (1) is in good agreement with theory.

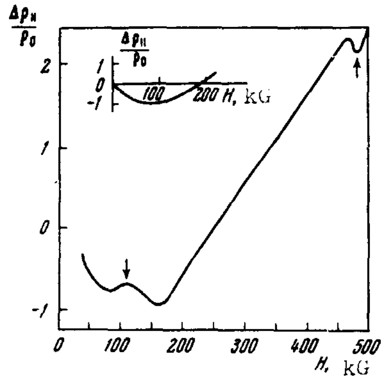

Fig. 1. ρ_{zz} of n-InAs vs. H at 300°K (lower curve) and 83°K (upper curve), in arbitrary units.

We investigated also the transverse magnetoresistance in the temperature interval 250 - 330°K. To show more clearly the nonmonotonic dependence of ρ_{xx} on the magnetic field H, we subtracted the voltage component U = bH (b = const) that depends linearly on H from the total signal at the input of the recording system. For the same purpose, the signal was differentiated twice with respect to time. But since $d^2\rho_{xx}/dt^2 \neq d^2\rho_{xx}/dH^2$, the latter method merely shows that the extremum is present, but gives no information on its exact position.

As seen from Fig. 2a, ρ_{xx} has a maximum at 76 kG. Figure 2b confirms the presence of a maximum in this region and of a minimum at ~30 kG. The maximum at 76 kG corresponds to $\epsilon_{0,-} \to \epsilon_{1,-}$ MPR transitions. It would be natural to relate also the minimum of ρ_{zz} at 78 kG (Fig. 1) to these transitions. However, at 300°K and 76 kG, the parameter Γ^{-1}, which characterizes the contribution of the scattering by optical phonons, is equal to ≈30, and according to Gurevich and Firsov [7] ρ_{zz} should have a maximum. The observed maximum of ρ_{zz} is situated at 110 kG (Fig. 1). Such a shift of the maximum of ρ_{zz} relative to the resonant value of H can be explained in the following manner. For InAs, at 300°K, $kT/\hbar\omega = 0.85$. Analysis shows that in the case of pure optical scattering the position of the maximum of ρ_{zz} corresponds exactly to Eq. (1) only when $kT \ll \hbar\omega_0$, and that the maximum of ρ_{zz} can shift toward larger fields by 10% when $kT/\hbar\omega_0 = 1/2$. With increasing temperature, this shift can reach 50%. In addition, the presence of nonresonant scattering can also shift the maximum of ρ_{zz} from the resonant position by $\Delta H \simeq \pm kT m^*/2\mu_B m$ (μ_B = Bohr magneton). It is possible that this factor, i.e., the change in the contribution of the different scattering mechanisms, is just the cause of the small

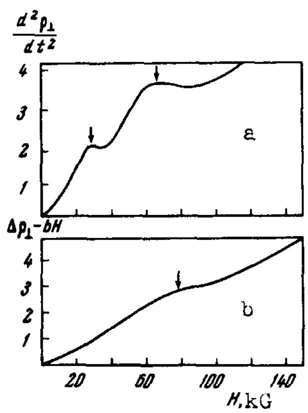

Fig. 2. ρ_{xx} of n-InAs ($n = 2.2 \times 10^{16}$ cm^{-3}) vs. H at 300°K in arbitrary units.

shift of the maximum of ρ_{zz} toward larger fields with decreasing temperature [4,5]. At $T \leq 100°K$, when the contribution of the optical scattering becomes small, the maximum of ρ_{zz} vanishes (Fig. 1).

In the $\hbar\Omega \sim kT$ region, ρ_{zz} has a negative section in the form of a broad minimum (Fig. 1). Therefore the presence of an MPR maximum at 110 kG leads to the appearance of two minima at ~78 and ~160 kG, which are not connected with the resonant scattering.

It is apparently impossible to set the maximum of ρ_{zz} at 110 kG in correspondence with the SMR transition $\epsilon_{0,+} \rightarrow \epsilon_{1,-}$, for at 300°K and at 110 kG the splitting of the Landau-level $g\mu_B H$ amounts to only ~0.3 kT.

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CONTINUOUS COHERENT RADIATION OF EPITAXIAL DIODES OF GaAs at 77°K

L. M. Kogan, L. D. Libov, D. N. Nasledov, T. F. Nikitina, I. N. Oraevskii, G. M. Strakhovskii, O. A. Sungurova, and B. V. Tsarenkov
P. N. Lebedev Physics Institute, USSR Academy of Sciences

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In this article we report continuous generation from a GaAs semiconductor laser with epitaxial pn junction operating with the medium at 77°K.

The junction was produced by liquid epitaxy by the Nelson method [1]. The substrate was a plate made of p-type material with hole density 2.4×10^{19} cm^{-3} and mobility 50 cm^2/V-sec oriented along the (100) crystallographic plane. The epitaxial layer was doped with tellurium to a density ~5×10^{18} cm^{-3}. Ohmic contacts were produced by vacuum sputtering of indium. A Fabry-Perot type resonator was produced by cleavage along the (110) plane. The finished diode was mounted in a holder with copper clamp contacts. The batch of diodes had resonator dimensions 0.2 x 0.2 mm and a thickness (distance between contacts) 0.15 mm.

The figure shows the development of the emission spectrum of the same diode as a function of the exciting current. Spectra 1, 3, 5, and 6 were obtained under continuous operation (currents 50, 250, 410, and 770 mA, respectively). Spectra 2 and 4 were obtained in pulsed operation (pulse duration 5 μsec, repetition frequency 10 kcs, currents 83 and 262 mA). It is seen that the maximum of the recombination spectrum shifts toward shorter wavelengths with in-