beats with a spectrum analyzer (ASCHKh-1) was less than 50 Hz (10^{-9} Å). There were no beats in this case in the spectral range 50 - 200 MHz.

It should be noted that under stationary generation conditions, the selection of the axial modes is much more reliable than in the presence of spikes, and the single-mode radiation is highly stable. Thus, elimination of the spiked character of the radiation of solid-state lasers makes it possible to obtain an exceedingly narrow generation spectrum.

We regard the following spike-production mechanism as being the most probable: Thermal heating of the active medium during the optical pumping or any mechanical instability of the resonator element can lead to a change of the effective resonator shape. If the change of the resonator length is homogeneous over the cross section, the Doppler shift causes the radiation frequency in each mode to follow exactly the shifting resonator frequency. If the change of the optical length of the resonator is not homogeneous over the cross section, as is practically always the case if the temperature variation is inhomogeneous and mechanical deformations set in, diffraction spreading causes radiation with different frequencies corresponding to the Doppler shift at different different points of the resonator cross section to pass through each point of the resonator cross section. As shown by preliminary computer calculations, radiation nonmonochromaticity of this type leads to the spikes.

Thus, to eliminate the spikes of the radiation it is necessary to prevent nonstationary deformation of the resonator which is inhomogeneous over the cross section.

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PHOTOCONDUCTIVITY OF p-CdSb IN THE MILLIMETER BAND

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When pure samples of p-CdSb ($N_A - N_D \sim 10^{15}$ cm^{-3} at 77° K) was exposed to radiation in the mm band ($\lambda \approx 4$ mm), an alternating voltage (response) of the same frequency as the modulation of the radiation incident on the sample was observed on the contacts used to apply the constant electric bias field. The absence of a response in p-CdSb at zero bias, and the linear variation of the response with increasing bias field (Fig. 1) in analogy with [1, 2], apparently signify that the observed effect is due to the change produced in the sample conductivity by the radiation, i.e., to the photoconductivity effect. Investigations of the field dependences of the Hall constant (R), the resistivity (ρ), and the Hall mobility ($R\sigma$) shows that these quantities (R, ρ, $R\sigma$) do not depend on the field in the range of fields corresponding to the region of linear variation of the response (ΔV). The response reaches saturation and then decreases in the region of fields in which carrier heating and impurity-center ionization sets in. Figure 2 shows the temperature dependences of ρ, R, and ΔV. The R(T) dependence has a singularity characteristic of a semiconductor with an impurity band. An

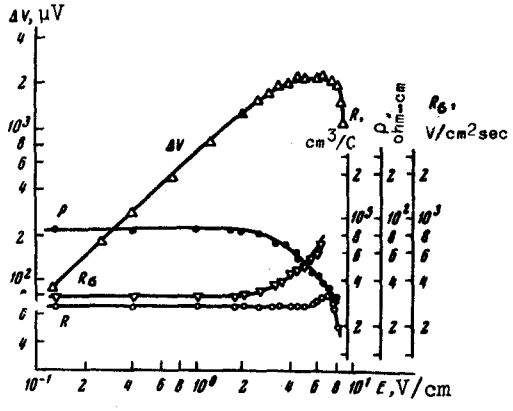

Fig. 1. Photoresponse (ΔV), resistivity (ρ), Hall constant (R), and Hall mobility (Rσ) vs. electric bias field (E) at 4.2°K.

estimate of the activation energy of the impurity centers in the in the investigated sample, using the procedure of [3, 4], yields a value $\sim 3 \times 10^{-3}$ eV. The temperature dependence of the response is proportional to exp (ε/kT) where $\varepsilon = 5 \times 10^{-3}$ eV and 2×10^{-3} in the high- and low-temperature regions respectively, and is analogous to the character of the temperature variation of the resistivity.

The radiation-quantum energy amounts in our case to $\sim 3 \times 10^{-4}$ eV, i.e., it is smaller by one order of magnitude than the energy gap between the impurity band and the valence band, so that the results cannot be attributed to an impurity photoeffect (we note also that the energy of the radiation quantum does not exceed likewise the thermal energy kT, which amounts to 3.6×10^{-4} eV at 4.2° K). The strictly linear dependence of the response on the field (up to saturation fields) excludes photoconductivity due to the mechanism of [5]. The activation energy of the inter-impurity transitions, determined from the slope of the $\ln \rho = f(10^3/kT)$ curve in the region of very low temperatures (beyond the maximum of R) [6], is equal to 4×10^{-4} eV, i.e., it is of the same order as the energy of the radiation quantum and the thermal energy. It is therefore natural to assume that the observed photoeffect is due to a change of the conductivity in the impurity band upon absorption of the mm radiation. Indeed, according to the results, the response occurs only in the temperature region, where the conductivity in the impurity band is significant, and is largest in the region where the contribution of the valence-band conductivity is negligible.

For the response we can write the following expression:

$$\Delta V = \frac{lE\Delta\sigma}{\sigma_{tot}}, \qquad (1)$$

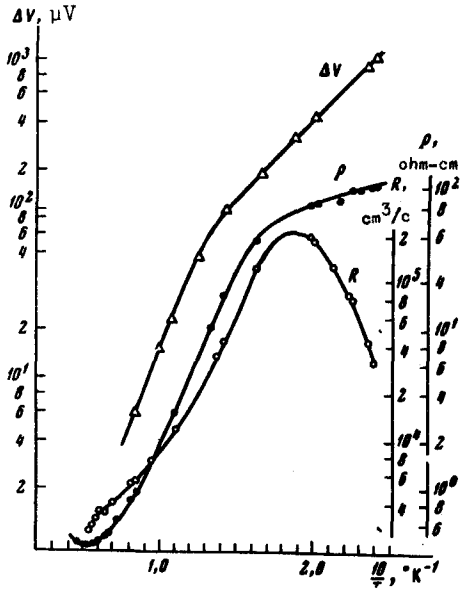

Fig. 2. Photoresponse (ΔV), resistivity (ρ), Hall constant (R) vs. temperature in a weak electric field.

where ℓ is the length of the sample, $\Delta\sigma$ is the change of the impurity-band conductivity under the influence of the microwave radiation, and σ_{tot} is the total impurity-band and valence-band conductivity, and its temperature dependence, in accordance with Fig. 2, is given by

$$\sigma_{tot} = C_1 \exp(-\epsilon_1/kT) + C_2 \exp(-\epsilon_2/kT), \tag{2}$$

where $\epsilon_1 = 3 \times 10^{-3}$ eV, $\epsilon_2 = 4 \times 10^{-4}$ eV, and C_1 and C_2 are constants.

The quantity $\Delta\sigma$ is proportional to the microwave radiation power W incident on the sample, and apparently to the number p_{imp} of the radiation-absorbing carriers in the impurity band. In the investigated temperature range we have $p_{imp} \sim \exp(\epsilon_1/kT)$ [7]. Then, according to (1) and (2),

$$\Delta V \approx \text{const}\, W E \frac{\exp \frac{\epsilon_1}{kT}}{C_1 \exp(-\epsilon_1/kT) + C_2 \exp(-\epsilon_2/kT)} \tag{3}$$

It follows from (3) that the response is proportional to $\exp(\epsilon_1/kT)$ in the low-temperature region and to $\exp(2\epsilon_1/kT)$ at high temperatures. The dependence of the response on the temperature, obtained experimentally (2), is in good agreement with the estimate (3).

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MOSSBAUER EFFECT IN TELLURIUM AT PRESSURE UP TO 100 kbar

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A study of the influence of high pressures p on the parameters of the Mossbauer spectrum (the probability f of resonant absorption (emission) of gamma quanta by nuclei in crystals, the isomer shifts, or the hyperfine splitting) can yield additional information on the electron structure of a solid and on the nature of phase transitions.

The investigation of tellurium under pressure is of interest since this material is a semiconductor under normal conditions and becomes a metal at high pressure.

Figure 1 shows the p-T phase diagram of tellurium, constructed on the basis of [1 - 5]. The first phase transition occurs at a pressure 15 - 20 kbar, and the chain structure of tellurium A8 goes over there into a layered rhombohedral structure of type A7 (arsenic structure). The Te II - Te III transition is observed at 45 kbar, and in this case the tellurium becomes a metal, but the structure of the Te III phase has not yet been established.

Several authors have noted a Te III - Te IV transition at 70 kbar at room temperature [1, 5], but an x-ray structure analysis of Te, carried out in [4] up to 90 kbar, casts doubts on the existence of this phase.

In our experiments, we applied pressure to a tellurium source containing the radioactive isotope Te^{125m}. The resonant absorber of the 35.6-keV gamma quanta was $MgTeO_4$, and the tellurium was enriched with Te^{125} to 88%. The absorber was moved at equal acceleration by an electrodynamic vibrator. The system for registering the gamma quanta consisted of an SI-6R proportional counter and a multichannel analyzer operating in the time mode.

The pressure was produced in a high-pressure chamber between the flats of cemented tungsten carbide Bridgman anvils, compressed by a mechanical press [6]. The investigated sample, pressed in the form of a tablet 0.85 mm in diameter and 0.1 mm high, was placed inside a guard ring of amorphous boron of outside diameter 2 mm, inside diameter 0185 mm, and height 0.1 mm.

The compression was at room temperature, after which the press was placed in a Dewar with liquid nitrogen.

Since the electronic attenuation of the 35.6-keV gamma rays in the tellurium material was such that all the gamma quanta from the outer ring of a tablet, $\leq$ 0.1 mm deep were registered, the pressure was determined for that section of the sample. The pressure was measured by means of a calibration curve based on known reference points of the phase