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Abstract

Full Text

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Excitation of a Semiconductor Quantum Generator by a Beam of Fast Electrons

It has already been reported earlier ([1,2]) on the first experiments in the excitation, by means of a beam of fast electrons, of nonequilibrium carriers in the bands of a semiconductor with the aim of creating a state with negative temperature. In the present note the first results are reported of experiments on obtaining stimulated emission from a CdS crystal.

When a CdS single crystal, placed on a cold finger in a helium cryostat, was irradiated with an electron beam of energy $\sim$ 200 keV, intense radiation was observed in the green part of the spectrum with wavelength 4966 Å. With an increase in the current density, the luminescence intensity rose sharply. When the current density was changed to three times above threshold, the luminescence intensity increased by two orders of magnitude. At the same time, a narrowing of the emission line from 35 to 7 Å was observed. The threshold current depended strongly on the quality of the crystals.

The apparatus operated in a pulsed mode, with current pulses of duration 2 μsec and a frequency of several tens of hertz. At low current densities the duration of the crystal afterglow after the end of the current pulse was 2 μsec. At maximum current densities the light pulse coincided exactly in time with the current pulse.

The experiments carried out show the possibility of using a beam of fast electrons for the excitation of semiconductor quantum generators.

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Cited Literature

1 N. G. Basov, O. V. Bogdankevich, ZhETF, **44**, 1115 (1963). 2 V. S. Vavilov, E. D. Egorov, E. L. Nolle, S. I. Vintovkin, Fiz. tverd. tela (in press).

Note: Figure translations are in progress. See original paper for figures.