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REGENERATIVE OSCILLATIONS AND DISPERSIVE-ABSORPTIVE OPTICAL HYSTERESES
WITH PECULIAR REGIONS IN SEMICONDUCTOR INTERFEROMETERS⁽¹⁾

A.V. GRIGOR'YANTS, Y.A. RZHANOV, Y.I. BALKAREI and M.I. ELINSON

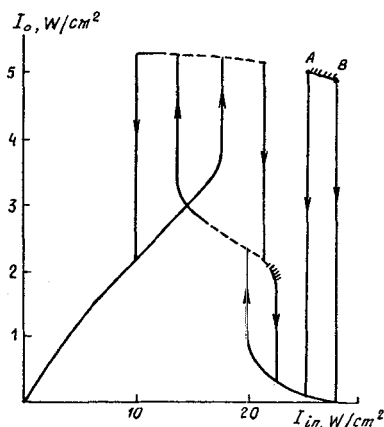
*Institute of Radioengineering and Electronics, Academy of Sciences
of the USSR, Marx Avenue 18, Moscow 103907, USSR*

We consider semiconductor Fabry-Perot interferometer (FPI) where interband free carriers photogeneration and heating due to recombination make a different sign contribution to the refractive index and temperature shift of band edge results in induced absorption. Such situation is realized in a number of semiconductors which demonstrate optical bistability (OB). Using the parameters of InSb /1,2/ we have numerically investigated transformation of steady input-output characteristic $I_o(I_{in})$ under variation of initial detuning δ_o of FPI. Different δ_o leads to the following characteristics: dispersive-absorptive hysteresis of "butterfly"-type /3/; "butterfly"-type hysteresis with unstable regions corresponding to McCall's regenerative oscillations (RO) /4/; single-valued characteristic with region of RO; as well as characteristic containing region of RO and absorptive OB with sharp decreasing of output intensity I_o at forward switching. The limits of changing of input intensity I_{in} , δ_o and characteristic thermal time are found, where RO and OB of dispersive and absorptive type are exist.

It was established that absorptive hysteresis can contain the peculiar region on the upper branch, which can be realized only under quasi static changing of I_{in} . In the case of pulse I_{in}

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changing the switching on the lower branch is observed without achievement of critical I_{in} value corresponding to quasi static switching. Such switching can be induced by pulse increasing or decreasing of I_{in} on the background of holding intensity. The switching from lower branch of absorptive hysteresis to the peculiar region of upper branch requires the pulse decreasing of I_{in} with strictly limited duration. If the pulse duration is beyond this limits, switching does not occur despite the fact that I_{in} was decreased below critical value. Such behaviour is connected with large difference between thermal time and carriers lifetime and is similar to overshoot switching /5/. If the temperature dependence of absorption is just weaker than for InSb, the characteristic $I_o(I_{in})$ can be much more complicated (Fig.). The unstable regions, corresponding to RO, are shown by dashed line, the shaded regions are the peculiar regions described above. The region AB is insulated and can be realized only by special choice of initial parameters.



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