...ion (and annihilation) conditions and on the external ...rcuit connections; no wholly stationary results were ...ound beyond limiting. Increasing the random-to-drift ...elocity ratio at the input destroys the repetitive nature ...f the oscillation and reduces the amplitude of the ...uctuations; further study is needed to see if the fluctua...ons were correlated with the random input and to see ...ow much increase in stability is gained by increasing ...e random content of the input.

The start oscillation conditions, from perturbation ...nalyses, indicate a weak start with no oscillation. How...ver, the energy behavior, calculated from total quanti...es, indicates a violent start, as does occur. The large ...gnal behavior of W, W_E, W_K and their time averages ...eeds to be developed further, in particular, to be ...eneralized to other models to get the start- and stop-...cillation conditions.

The analysis of stability in one-dimensional (infinitely ...road) electron diodes is now made fairly complete. The two-dimensional (finite diameter stream) diode is shown to behave in a similar manner, but this study is not as exhaustive. The results are useful in themselves with applications to diode and drift-tube stability and to noise smoothing in electron guns and to oscillations in thermionic converters as given in Ref. 1. The results obtained are clues of what to compute and what to look for in more complex configurations.

The experimental observations by ourselves and others are only in partial agreement with these calculations. There is need for extending the analysis to include more effects as well as for improving the understanding of the experiments in order to obtain closer agreement.

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Effect of Hydrostatic Pressure on the Emission from Gallium Arsenide Lasers

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The pressure shift of both the coherent and the incoherent emission of GaAs junction lasers has been measured at about 200°K. The peak of the spontaneous emission shifts by $+1.09\times10^{-5}$ eV/atm, which is in agreement with the pressure coefficient of the band gap in GaAs determined by experiments based on the change of resistance under pressure. The shift of the coherent modes is much smaller, namely, $+2.96\times10^{-6}$ eV/atm. The effect of the compressibility on the latter shift is shown to be negligible. It is concluded from considerations of a simple model that the shift of the coherent radiation is primarily due to a change of the dielectric constant with pressure.

THE recent achievement of coherent light emission from forwardly biased GaAs junctions has pro...ed a tool for more accurate measurements of certain ...c parameters of semiconductors. This paper reports ...e results of hydrostatic pressure experiments on the ...rent as well as the incoherent output of GaAs lasers ...00°K. Like the more familiar types of lasers the ...tion device consists of two basic ingredients: a ...n in k space with inverted population where ...taneous and stimulated emission can occur and a ...on in physical space forming an optical resonator to ...ain prolonged oscillations. The first is determined the band structure of the material, whereas the ...d depends on the physical dimensions and the ...tric constant of the medium. Pressure affects these ...erties differently, and therefore we discuss each of ...m in turn.

...a junction laser the population inversion is ...ved by the injection of a large number of both types of carriers into the junction separating n- and p-type material, where electrons and holes can recombine and emit photons. The exact nature of the process is still subject to speculation. It may involve either conduction band-to-valence band transitions or transitions involving discrete impurity levels close to either of the band edges. One might hope to distinguish between some of the transitions by the difference in effect pressure might have on the energy states involved. The energy of the emitted radiation is smaller than the gap energy by about 0.04 eV. Therefore, only shallow impurity states could possibly be involved in the emission process. One can estimate the effect of pressure on such a state by adopting a hydrogenic model for the impurity. Assuming the change of the ionization energy to be due to the change of the effective mass and the dielectric constant, the estimated shift of the level with respect to the band edge is about 5% for the maximum pressure of 2000 atm employed in our experiments. The experi-