values $E_{exp}$ were taken from the paper of Meyerand and Haught [4], from [3], and from the present measurements. It should be noted that the diffusion losses under the conditions of the experiments in [3] can be estimated by assuming a free diffusion mode. Indeed, the solution of the equation describing the time variation of the number of electrons (provided the diffusion coefficients do not depend on the energy), with allowance for the transient character of the diffusion [5], leads to a correction factor on the order of unity in the calculation of $E_{theor}$ - the threshold electric field intensity.

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## STIMULATED RESONANCE EFFECTS IN POTASSIUM VAPOR

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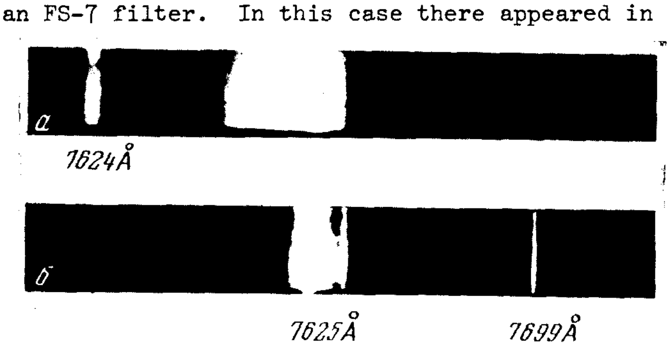
We present here experimental results on the passage of intense optical radiation through potassium vapor. We observed intense stimualted emission at wavelengths 7665 Å and 7699 Å coinciding with the resonant $4P_{3/2,1/2} - 4S_{1/2}$ transitions of the potassium atoms. Insofar as we know, no such effect has been reported in the literature. We also obtained stimulated emission at a wavelength 7624 Å as a result of Raman scattering from the excited electronic level $4P_{3/2}$ [1].

The intense-radiation source was a ruby laser with passive shutter, with an approximate power of 50 MW. A cell 10 cm long, filled with nitrobenzene and placed in the unfocused beam of the main radiation, produced an intense Stokes component of stimulated Raman scattering at a wavelength $\lambda_2$ = 7658 Å. The radiation with $\lambda_1$ = 6943 Å and $\lambda_2$ = 7658 Å was focused with a lens in a cuvette 10 cm long filled with potassium vapor. The cell with the potassium was heated to 250 - 350°C, corresponding to a vapor pressure 0.05 - 1.7 mm Hg. The light passing through the cell was registered with a DFS-13 spectrograph.

In one series of experiments, only light at wavelength $\lambda_2$ was focused on the cell, and the main ruby radiation at $\lambda_1$ was blocked with an FS-7 filter. In this case there appeared in the spectrum an intense component on the short-wave side, at 7624 Å (Fig. a). This radiation is connected with the two-photon stimulated effect, as a result of which the excited potassium atoms are transferred from the $4P_{3/2}$ level to $4P_{1/2}$. The same effect was observed in [1].




On the other hand, when the main laser

emission was focused on the cell with the potassium vapor in addition to the $\lambda_2$ radiation, the narrow resonance lines of atomic potassium were observed (Fig. b), with an intensity that reached 10 - 20% of the intensity of the Stokes component. These lines appear only after a definite potassium vapor pressure is obtained and when the intensity of the incident radiation exceeds a certain threshold value ($\sim$30 MW at $\lambda_1$). Control experiments with a spherical cell have demonstrated the absence of such radiation in a direction perpendicular to the incident radiation. With increasing working temperature of the ruby, which shifted the ruby emission line as well as the Stokes component, the intensity of the produced new lines increased.

It must be emphasized that when both wavelengths $\lambda_1$ and $\lambda_2$ were present in the incident radiation, only the stimulated resonnace lines of potassium were observed in the spectrum, and not the short-wave emission at 7624 Å. On the other hand, when the potassium was excited only with the Stokes component of the nitrobenzene, we did not observe the potassium atom lines.

These effects can be explained as follows: Owing to the closeness of the intense Stokes emission to the resonant transition $4S_{1/2}$ - $4P_{3/2}$ of potassium (deviation 7 Å), the $4P_{3/2}$ level is appreciably populated. The presence of the main radiation at 6943 Å besides the Stokes component of nitrobenzene in the incident radiation leads to an intense transition from the $4P_{3/2}$ excited level to the $6S_{1/2}$ level. (This transition corresponds to the wavelength 6939 Å.) Under similar conditions, a stimulated transition from the $6S_{1/2}$ level to the 5P levels was observed in [2,3]. No stimulated transition from $6S_{1/2}$ to $4P_{1/2}$ was observed, apparently, both as a result of relaxation between the levels $4P_{3/2}$ and $4P_{1/2}$, and as a result of spontaneous transitions from the upper levels. The intense transition from the $4P_{3/2}$ level to $6S_{1/2}$ contributes to a considerable depletion of the ground level $4S_{1/2}$ and leads, under the conditions of our experiment, to inversion of the populations of the 4P levels relative to $4S_{1/2}$ and to stimulated resonant emission.

Besides the indicated lines, the spectra revealed also intense narrow absorption against the background of the Stokes component of nitrobenzene, usually located between the center of the Stokes line and the potassium atom line. This absorption changes position from pulse to pulse and is observed under the conditions of our experiment only when the main laser emission is also present in the incident light. The available data are apparently insufficient to explain conclusively the occurrence of this absorption, and additional investigations are therefore under way.

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