[2]. The expression obtained there for the time variation of the inverted population ΔN is in our case of the form

$$\frac{d\Delta N}{dt} = -\frac{2\Delta N}{\hbar}\chi^{(1)''}(\omega_2)A^2(\omega_2) - \frac{\Delta N}{\hbar}\chi^{(3)''}(\omega_2)\sin^2\phi A^2(\omega_2)A^2(\omega_1) - \frac{\Delta N - \Delta N_0}{T}.$$

Here $A(\omega)$ are the real amplitudes of the field of frequency ω, $\chi^{(1)''}$ is the imaginary part of the component of the second-rank nonlinear-suseptibility tensor, $\chi^{(3)''}$ is the imaginary part of the component of the fourth-rank nonlinear-susceptibility tensor, $\sin^2\phi$ is a factor connected with the phase of the interacting fields, and T is the lifetime of the excited state.

It follows therefore that the ratio of the terms determining the parametric interaction and the ordinary generation is proportional to the intensity of the field of frequency ω_1. An increase of this field in the experiment led to an increase of the contrast of the parametric line relative to the spectrum of the ordinary generation.

The proposed scheme of parametric interaction in which resonant radiation takes part can be used to develop radiation generators with smoothly variable frequency in practically any region of the spectrum. This is realizable by using an extensive class of generating dyes and other compounds having broad radiation bands and various exciting lasers[1]. The range of frequency tuning can be extended by increasing the densities of the exciting flux and by changing the solvent and the concentrations of the solution.

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NARROW RESONANCES IN THE SATURATION OF ABSORPTION OF SF_6 BY CO_2-LASER EMISSION

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In [1 - 3[it was proposed to use the effect of saturation of the absorption of rotational-vibrational transitions of a low-pressure molecular gas in a coherent light field to obtain narrow resonances within the Doppler line and to stabilize the frequency of a laser by means of these resonances. Ultrahigh stabilization schemes were proposed using nonlinear absorbing cells either inside [1 - 3] or outside the resonator [4, 5], by means of the power peak [2, 4, 5] or by means of the auto-stabilization effect [1, 3, 5]. The efficacy of the proposed method is evidenced by the attainment of stability and reproducibility of the freqeuncy within 10^{-11} in an He-Ne laser operating at $\lambda = 3.39\ \mu$ by saturating the ab-

[1] Suppression of one spectral line and its shift as a function of the angle was observed by us also in cyan dyes excited by ruby-laser emission.

sorption of the CH_4 [1] inside the resonator [6]. The purpose of the present paper is to report observation of narrow dips inside the Doppler line of two rotational-vibrational transitions of the ν_3 band of the SF_6 molecule[2] by the method of nonlinear absorption of a quasitraveling wave of a CO_2 laser in an external low-pressure SF_6 cell. This uncovers a possibility of investigating in detail the uperfine structure of the rotational-vibrational transitions of the SF_6 molecule and of obtaining extremely high stabilization of the CO_2-laser frequency.

The experimental setup was as follows. The beam of a CO_2-N_2-He laser with an NaCl prism in its cavity was passed through an external cell (80 cm long) filled with gaseous SF_6 at a pressure 10^{-3} - 10^{-1} Torr. A small part (about 3%) of the radiation transmitted by the cell was reflected back, passed through the cell again, and was registered with a Ge:Au photoreceiver. The radiation power was adjusted to produce saturation of the absorption of the forward wave and to produce linear absorption of the weak backward wave. The frequency of the CO_2-laser emission was tuned within the limits of the Doppler line by scanning the position of the resonator mirror mounted on a piezoceramic.

When the emission frequency ν coincides exactly with the center ν_0 of the absorption line, the backward weak wave interacts with the molecules whose absorption is saturated by the strong forward wave. In this case the absorption of the wave is much smaller than when the emission frequency is detuned away from the center of the SF_6 Doppler line. The dependence of the absorption coefficient of such a quasitraveling wave on its frequency should therefore have a narrow resonance at the frequency $\nu = \nu_0$, with a width determined, at low gas pressure, by the travel time of the molecules through the beam and by the degree of saturation [5].

The experimentally measured dependence of the power of the quasitraveling wave passing through the cell at an SF_6 pressure $p = 2 \times 10^{-2}$ Torr on its frequency is shown in Fig. 1 for one of the most intense vibrational-rotational lines of the CO_2 laser. Several narrow resonances, revealing the presence of a structure inside the Doppler line, were observed within the limits of a part of the Doppler line. The width of the narrowest resonance, shown in Fig. 2, was 1.2 ± 0.2 MHz at an SF_6 pressure 5×10^{-2} Torr. The remaining resonances have a width 1.6 - 3.0 MHz. The resolution in the experiment was 0.5 ± 0.25 MHz. This value consists of the broadening due to the finite transit time of the molecules through the beam (0.1 MHz), the broadening due to the saturation (0.1 ± 0.05 MHz), and the broadening due to the collisions (0.3 ± 0.2 MHz). The difference between the observed minimal width and the limiting resolution, and the differences in the resonance widths, are apparently due to the presence of an unresolved structure within each resonance.

Resonances were observed at cell pressures 2×10^{-1} - 8×10^{-3} Torr, when the linear absorption of the cell per pass varied in the range from 1000 to 30%. At a pressure $p = 5 \times 10^{-2}$ Torr, the amplitude of some of the resonances was close to 100%. At low pressures, the amplitude of the resonances decreased as a result of the decreased absorption, and at

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[1] Saturation of the absorption of the CH_4 molecule in order to stabilize the frequency of an He-Ne laser at $\lambda = 3.39$ μ was proposed in [1 - 3].

[2] According to [7], the molecule SF_6 has a strong nonlinear absorption at the frequencies of the CO_2-laser transition at 10.6 μ.

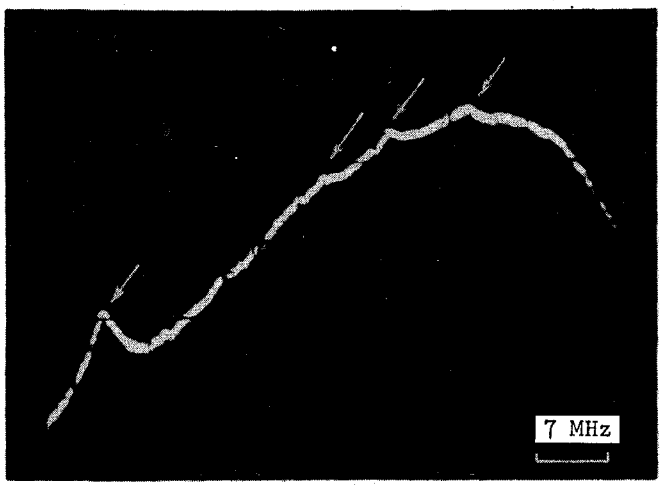

Fig. 1

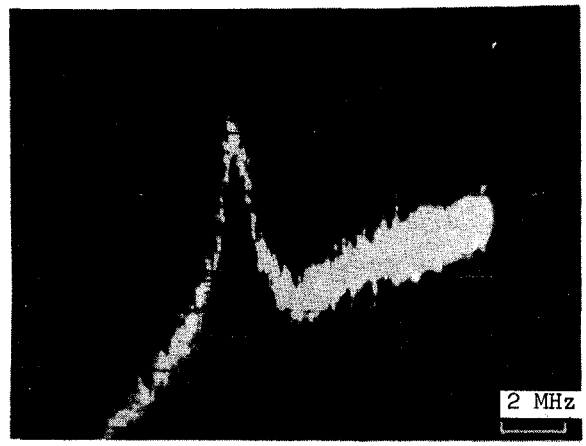

Fig. 2

Fig. 1. Oscillogram showing the power of the quasitraveling wave passing through the SF_6 cell as a function of the frequency, for one of the most intense rotational-vibrational lines of the CO_2 laser. Gas pressure in cell $p = 2\times10^{-2}$ Torr, cell length 80 cm. The arrows indicate the observed resonances.

Fig. 2. Oscillogram of one of the narrow resonances observed within a part of the Doppler line. Width at half-height 1.2 ± 0.2 MHz.

high pressures it increases as a result of the increase in the power needed to saturate the absorption.

Work aimed at clarifying the nature of the resonance broadening is being continued.

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PRESSURE DEPENDENCE OF THE TEMPERATURE OF THE TRANSITION OF THE COMPOUND Bi_2K INTO THE SUPERCONDUCTING STATE

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As is well known [1], the compound Bi_2K becomes superconducting at $T = 3.57°K$ and has a positive derivative of the critical temperature with respect to pressure. This compound was one of the first superconductors revealing a positive sign of $\partial T_c/\partial p$ [2]. Experiments aimed at determining the influence of the pressure on T_c of Bi_2K were carried out earlier [2] only at a pressure close to 1500 atm. We deemed it of interest to study the