The measured cross section at the kink does not differ strongly from (3), amounting to $\sim 10^{-36}$ cm^2/GeV. The preliminary data [1] lie between this value and that given in (4).

We thank R.M. Muradyan, whose report of the experiment of [1] stimulated this work, and N.N. Achasov, B.V. Serebryakov, L.D. Solov'ev, G.N. Shestakov, and D.V. Shirkov for useful discussions.

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STIMULATED MANDEL'SHTAM-BRILLOUIN SCATTERING IN THE REGION OF THE CRITICAL LAMINATION POINT OF SOLUTIONS

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We have obtained, for the first time, stimulated Mandel'shtam-Brillouin scattering (SMBS) near the critical lamination point of a solution (Fig. 1a). We investigated a solution of 0.4 molar fractions of nitrobenzene in normal hexane, having an upper lamination temperature $t_c = 20 \pm 0.05°C$.

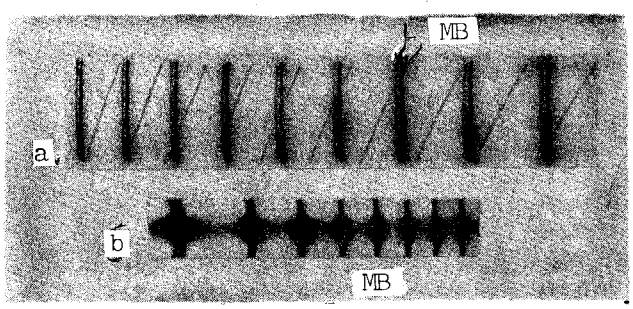

Fig. 1. Interference spectra of stimulated (a - interferometer dispersion region $\delta\nu = 2.5$ cm^{-1}) and thermal (b - $\delta\nu = 0.5$ cm^{-1}) Mandel'shtam-Brillouin (MB) scattering in a solution of 0.4 molar fractions of nitrobenzene in n-hexane at $(t - t_c) = 0.1°C$. L - laser emission line.

The SMBS method has advantages over the method of thermal Mandel'shtam Brillouin scattering (TMBS) in the study of the velocity of hypersound near the critical point of solutions, and also of pure substances[1]. The SMBS spectra can be registered within a time $\sim 10^{-8}$ sec, whereas in TMBS the exposure lasts from several minutes to several hours. In TMBS near t_c the error in the measurement of the positions of the MB components is usually much larger, owing to the increased intensity of scattering at the unshifted frequency [1, 2]. It is obvious that the position of the SMBS components under the same conditions can be measured without loss of accuracy (cf. Figs. 1a and b). In the direct vicinity of the critical point, owing to the decrease of the temperature conductivity, there should be no stimulated

[1] Tuberman and Morozov [3], following a suggestion by I.L. Fabelinskii, were the first to obtain SMBS near the critical point of a pure substance (CO_2).

temperature scattering (STS), which can influence the position of the SMBS components [4][2].

It can be assumed that a giant pulse of laser radiation does not change the critical parameters of the medium, since the characteristic time τ of the variation of these parameters is large compared with the duration of the laser pulse. Indeed, $\tau \sim \ell^2/D$, where ℓ is the correlation radius of the density fluctuations and D is the diffusion coefficient. Near the critical point of the solution we have $\ell \sim 10^{-6}$ cm, $D \sim 10^{-7}$ cm^2/sec, and $\tau \sim 10^{-5}$ sec, which is much larger than the duration $\sim 10^{-8}$ sec of the customarily employed pulses. On the other hand, τ is much larger than the SMBS establishment time ($\sim 10^{-9}$ sec), and the conditions of the critical point should influence only the threshold of the SMBS phenomenon (raise it).

In our investigation the SMBS was excited by ruby-laser pulses of duration on the order of 10^{-8} sec and power close to 15 MW far from the critical point and 20 - 30 MW near this point. The laser radiation was focused with a lens of focal length 8 cm inside a cell with the solution. The temperature conditions of the experiment were analogous to those of the experiment in [1]. Backward SMBS was observed.

Figure 2 shows the temperature dependence of the shift $\Delta\nu$ of the SMBS components near t_c. It was found earlier [1] that the refractive index has no noticeable anomalies near t_c, and therefore the data on $\Delta\nu$ describe the behavior of the velocity of hypersound.

The dashed line in Fig. 2 shows the previously obtained [1] data on the shift of the TMBS components, of the same solution. The increased shift of the SMBS components near t_c, compared with TMBS, can be attributed to the absence of a systematic error in the measurements of the SMBS components. This error appears in the TMBS spectra as a result of the strong scattering at the unshifted frequency. Another reason is the different influence exerted on $\Delta\nu$ by the gravitational effect.

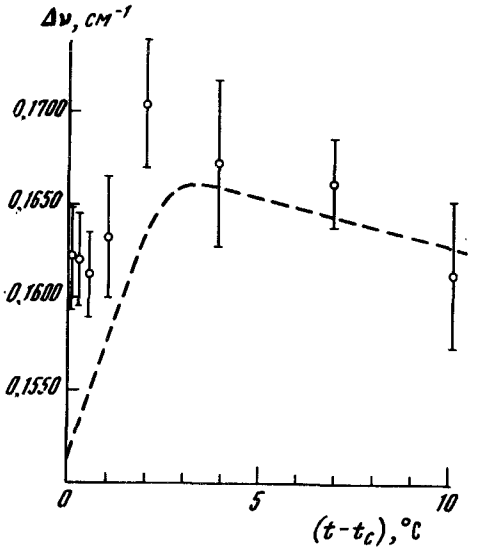

Fig. 2. Shift of SMBS components in a solution of 0.4 molar fractions of nitrobenzene in n-hexane near the lamination temperature t_c (points). The dashed curve shows the shift of the TMBS components in the same solution, referred to a scattering angle 180° and to the frequency of the ruby-laser emission.

In conclusion, we are grateful to I.L. Fabelinskii for interest in the work and discussions, and to V.S. Starunov for a discussion of the experiment.

[2] The temperature conductivity is $\chi = \kappa(C_p\rho)$, where κ, C_p, and ρ are respectively the thermal conductivity, the specific heat, and the density. C_p diverges in the immediate vicinity of t_c of the solution. Near the critical point of the pure substance, C_p varies approximately like $(t - t_v)^{-1}$ and no STS is produced in a wider temperature interval about t_c.

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PASSIVE Q SWITCHING AND STABILIZATION OF A RUBY-LASER FREQUENCY WITH MOLECULAR RUBIDIUM VAPOR

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We observed generation of a giant ruby-laser pulse with a stable emission frequency when a cell with molecular-rubidium vapor was placed in the resonator.

The use of molecular potassium vapor for passive Q switching of lasers was reported in [1]. The presence of a rotational structure in the absorption spectra of diatomic molecules gave grounds for hoping that the generation would occur at the frequency of minimum absorption, as a result of which the generated giant pulse would have high monochromaticity and atomic stability.

The difficulty in using K_2 vapor to verify this hypothesis lay in the need for working at relatively high temperatures (400 - 450°C) in order to obtain sufficiently high K_2 concentrations, when the potassium enters quite rapidly into the softened glass of the cell. This has made it impossible to obtain a stable generation regime and to determine the frequency stability of the generated radiation. Preliminary experiments have established that Rb_2 vapor has a larger absorption cross section than K_2 at $\lambda \sim 694$ nm, and becomes noticeably bleached under the influence of ruby-laser radiation of intensity $\sim 10^3$ W/cm^2. Since the stipulated Rb_2 concentration is reached at much lower temperatures than that of K_2, we chose Rb_2 for the purpose of verifying the aforementioned hypothesis.

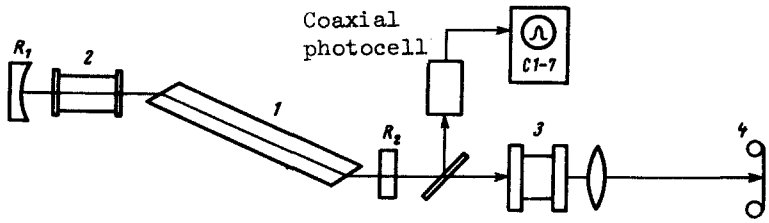

Fig. 1. Experimental setup: 1 - ruby rod; 2 - cell with saturated Rb_2 vapor, 3 - Fabry-Perot interferometer, 4 - photographic camera.

The experimental setup is illustrated in Fig. 1. A ruby rod 1, with end faces cut at the Brewster angle, was placed in an illuminator consisting of two straight IFP-1500 lamps, with a pump energy ~3 kJ, and was cooled with thermostat-controlled running water. Cell 2, 70 mm long, filled with saturated rubidium vapor at 375 - 400°C was placed in the hemispherical laser resonator with mirrors R_1 and R_2 (reflection coefficients 99 and 40%, respectively). Under these conditions, we observed generation of a giant bell-shaped pulse of duration ~50 nsec at the half-width and of energy 0.1 J. With further increase