but the luminosity increases by 40%. The increase in the glow intensity can be explained only by assuming that when the discharge is produced in a magnetic field the spreading plasma moves against the magnetic-pressure forces and expands more slowly, and the kinetic share of the energy decreases. The emission is increased, first, because part of the kinetic energy goes into Joule heat when the conducting plasma moves in the magnetic field, and second when the expansion (and hence cooling) is slowed down, a greater part of the energy can be radiated.

The lowering of the breakdown threshold is apparently connected with a slowing of the diffusion of the photoelectrons from the focal region, since their Larmor radius (at H = 200 kG) is approximately 10^{-5} cm, which is several times smaller than the mean free path even at atmospheric pressure.

We note in conclusion that the authors of [5], who observed optical breakdown in argon at H = 100 kG, discovered no influence of the magnetic field on the breakdown threshold. This is probably due to the insufficient magnetic field strength.

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STIMULATED TEMPERATURE SCATTERING OF LIGHT IN LIQUIDS

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The spectrum of thermal molecular scattering of light in liquids consists [1] of Mandel'shtam-Brillouin components (scattering by pressure fluctuations), a central component (scattering by entropy or temperature fluctuations), and a Rayleigh-line wing (scattering by anisotropy fluctuations). Observations and studies were already made of stimulated Mandel'shtam-Brillouin scattering (SMBS) [1,2] and stimulated light scattering in the Rayleigh-line wing [2, 4].

In this article we report observation of a new nonlinear phenomenon, namely stimulated temperature (entropy) scattering of light (STS).

The phenomenon consists of intense temperature waves produced when an intense exciting laser giant pulse and a weak initial scattering by entropy fluctuations interact with a medium. The interaction of these waves with the exciting and scattered light causes energy to be transferred from the exciting light to the scattered light and to the temperature wave.

In the case of scattering through angles that are not too small, when four-photon

interaction (interaction of two photons of the exciting light with Stokes and anti-Stokes photons in the nonlinear medium) is not significant, only the Stokes part in the spectrum of the scattered light shold become amplfied, the maximum amplification taking place at the frequency corresponding to the half-width of the central line of the thermal-scattering fine structure:

$$\Omega_{max} = \frac{\delta\omega_c}{2} = \frac{1}{2}\vec{q}^2\chi, \text{ where } \vec{q} = \vec{k}_0 - \vec{k}_1,$$

$\vec{k}_0$ and $\vec{k}_1$ are the wave vectors of the exciting and scattered light, respectively, $\delta\omega_c$ is the half-width of the central component of the central scattering, and χ is the thermal conductivity coefficient.

For Stokes STS, the amplification coefficient is*

$$g_T(\Omega) = -2k_\omega + B_T|\vec{k}_1| \frac{\Omega/\Omega_{max}}{1 + \Omega^2/\Omega^2_{max}}, \quad (1)$$

where $2k_\omega$ is the light absorption coefficient, B_T is a constant for the given medium, with a value that increases with increasing $|(\partial\varepsilon/\partial T)_p|$, and Ω is the cyclic frequency reckoned from the frequency of the exciting light.

The maximum of the Stokes STS for a liquid differs from the frequency of the exciting light by an amount $\sim 10^{-3} - 10^{-4}$ cm^{-1}, so that such a frequency variation can be effected by the method of heterodyning the light. The exciting line should have here a half-width $\sim 10^{-4} - 10^{-5}$ cm^{-1}. We have not yet performed such an experiment, and proceeded along a different path.

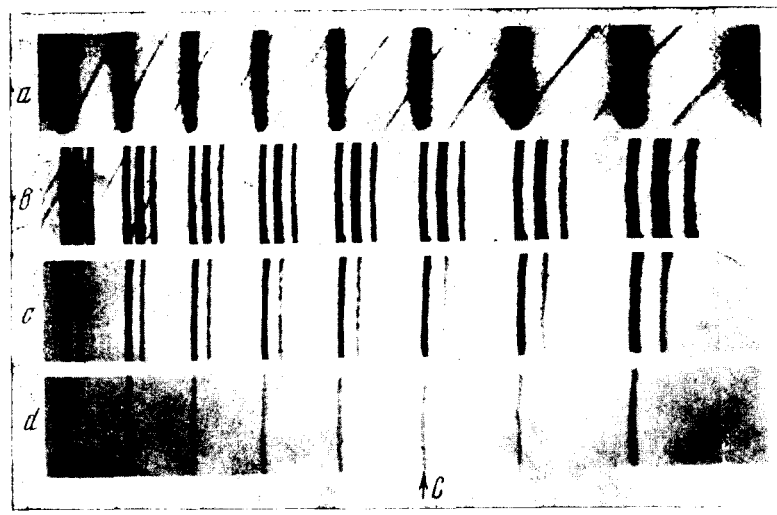
We have photographed simultaneously the spectrum of the stimulated scattering of light at a scattering angle 180° (0°) and at an angle 90°. The liquids used for the investigation were water, methanol, and benzene. No STS should be observed in water, for which $\gamma = c_p/c_v \approx 1$ (c_p and c_v are the specific heats at constant pressure and volume, respectively) and there is practically no central component in the thermal scattering. To the contrary, the central component in benzene is very intense, $|(\partial\varepsilon/\partial T)_p|$ is large, and in this liquid we can expect STS. Methanol is intermediate between water and benzene.

We used a ruby laser [3,4] of 90 MW power. The light was focused in the cell with the investigated liquid by a lens (f = 2.5 cm). Measures were taken to prevent parasitic light from entering the optical setup with the Fabry-Perot interferometer, which was used to register the light at 90° scattering angle.

There is no central component in the interference patterns when light is scattered in water at 90°. **

In benzene, the central component was observed when the light was scattered at 90° and its intensity decreased nonlinearly when the intensity of the exciting light was decreased.

The figure shows the unshifted and shifted fine-structure lines for benzene. Although the observation was made at the scattering angle $\theta = 90°$, the distance between components corresponds to a scattering angle $\theta = 180°$. This means that under our conditions there are no Mandel'shtam-Brillouin components corresponding to $\theta = 90°$. The appearance of shifted components ($\theta = 180°$ can apparently be regarded as scattering of the SMBS components corres-



Interference pattern of light scattered by benzene at a scattering angle $\theta = 90°$. Fabry-Perot interferometer dispersion region 1 cm^{-1}. a - ruby laser emission spectrum; b - spectrum of light scattered by benzene ($\theta = 90°$) at a ruby laser power 90 MW focused in the cell by a 2.5-cm lens; c and d - the same with the laser emission intensity decreased by factors 2.6 and 6, respectively. C - central component produced in STS.

ponding to $\theta = 180°$ by the intensified "temperature wave." If this is so, then several STS components are seen in the figure directly.

There was the danger that possible inhomogeneities produced in the liquid in the laser focus (such as cavitation) might spread the exciting light and this might mask the STS. We therefore performed an experiment with methanol, whose hydrodynamic characteristics are such that benzene occupies an intermediate position between it and water. Nonetheless, in accord with the small value of $|(\partial\varepsilon/\partial T)_p|$ and γ, the intensity of the central component in scattering at an angle $\theta = 90°$ was smaller in methanol than in benzene, and vanished when the laser emission intensity dropped by a factor of six. At this attenuation, the central component was still observed in benzene.

The described experiments thus convince us that we have observed STS in benzene.

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*We are considering plane waves, the process is assumed to be stationary, and the pulse duration is much longer than the temperature settling time. If second sound can propagate in the medium, the solutions obtained are different and are similar to those for usual SMBS.

**During the performance of this work we observed several side effects which are still under study at present.

RESISTANCE OF A THIN SUPERCONDUCTING CURRENT CARRYING FILAMENT

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1. The influence of temperature fluctuations on the smearing of current in a superconducting junction was noted by Pippard [1]. In recent investigations [2,3] this problem was