

gularity is a manifestation of the $\Delta(2360)$ resonance (its position and width are indicated in the figure).

Figure 3 shows the angular distribution of elastic π^-n backward scattering at an average pion momentum 2.8 BeV/c (the cross sections were obtained by a difference method and were averaged in the 2.1 - 3 BeV/c momentum interval). A peak is seen in the region of $\cos\theta^* = -1$. The slope of the peak relative to the momentum transfer is $(d/du)\ln(d\sigma/d\Omega) = (18^{+21}_{-7}) \text{ BeV}^{-2}$.

Figure 2 shows the upper limit (with 90% confidence) of the cross section for the elastic backward scattering reaction $\pi^+ + n \rightarrow \pi^+ + n$, obtained by us in a short exposure.

1) From the value of R we found that the average number of neutrons of the oxygen nucleus, which participate effectively in reaction (1), is $\bar{n} = 1.6 \pm 0.4$.

USE OF THE PINCH EFFECT FOR OPTICAL LASER PUMPING

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The authors have shown earlier [1,2] that a self-compressed strong-current discharge (pinch) is a powerful source of radiation in the ultraviolet and the visible regions (2000 - 6000 Å). The characteristics of this radiation (form of the spectrum, intensity, etc.) are determined by the discharge conditions (working gas, current density, discharge-chamber construction, etc.). Depending on the experimental conditions, we can obtain both discrete and continuous radiation of varying power.

In this paper we describe experiments on the use of the radiation from a straight pinch for optical pumping of Nd^{3+} -glass and ruby lasers. The experiments were carried out at currents up to 300 kA, with a rise rate of $\sim 3 \times 10^{11} \text{ A/sec}$ and a discharge period $\sim 4 \mu\text{sec}$. The energy source was a specially constructed low-inductance capacitor bank rated 30 μF at 9 kV working voltage. The current switching was by means of ring-type vacuum discharge unit with eight igniting electrodes. The parasitic inductance of the resonant circuit (the self-inductance of the capacitor bank, the discharge unit, and the leads) was reduced to 6 nanohenry.

Under the given experimental conditions (current density 20 kA/cm²) the light yield was $\sim 12\%$. With 1.2 kJ electric energy delivered by the bank, the optical radiation energy was $\sim 150 \text{ J}$, of which 50 - 70 J was in the 4000 - 6000 Å region and 80 - 100 J in the 2000 -

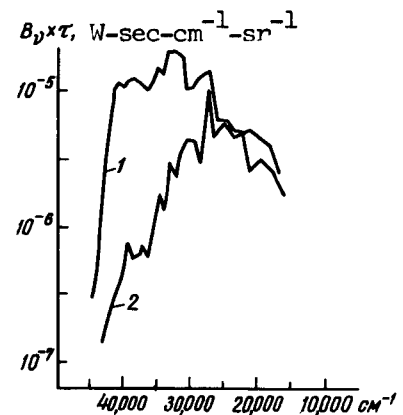


Fig. 1. Distribution of spectral brightness: 1 - spectrum from end of chamber, 2 - spectrum from the side.

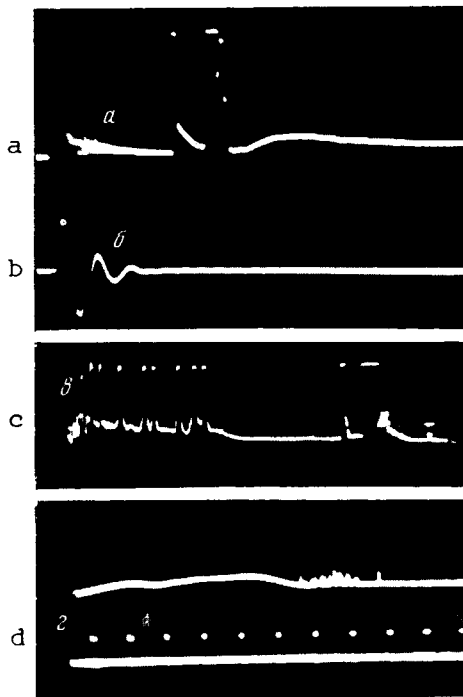


Fig. 2. Oscillograms of stimulated emission. a - Nd^{3+} glass; b - current pulse of 300 kA, $T = 6 \mu\text{sec}$; c - ruby crystal using combined pump; d - Nd^{3+} glass using IFP-800 xenon lamp for pump. Time pips at 100 μsec intervals.

4000 Å region. The emission spectrum was continuous, close in character to the emission spectrum of a black body with temperature 35,000°K. Figure 1 shows the distribution of the spectral brightness in the central part of a Kr discharge at 1 mm Hg pressure.

In the experiments with the neodymium-glass crystal, the discharge chamber was made of quartz, its diameter was ~ 30 mm, and its length 100 mm. The neodymium-glass crystal was 7.6 mm in diameter and 53 mm long. The ends of the crystal were silver coated (reflection coefficients 0.92 and 1). The stimulated emission ($\lambda = 1.06 \mu$) was registered with an FEU-22 photomultiplier with appropriate filters. Figure 2a shows an oscillogram of the generation from the crystal with only the pinch pump applied. The crystal pump flash was registered with an FEU-14B photomultiplier (sensitive up to 7000 Å). Generation set in $\sim 15 \mu\text{sec}$ following the start of the discharge. The generation lasted $\sim 8 \mu\text{sec}$. Figure 2d shows oscillograms of the stimulated emission of the same crystal using a standard elliptical reflector and an IFK-800 lamp. The pump light energy was the same in both cases.

To induce generation in the available ruby crystal at the given pinch power, we used a combined pump system. A two-loop elliptical illuminator was used in the experiments. The ruby crystal was placed in the common focus. The discharge chamber for the pinch and a xenon lamp to produce an additional light background were placed in the two other foci. Figure 2c shows an oscillogram of the emission stimulated with this pump system. Under these experimental conditions the frequency of pulsation of the stimulated emission increased by ~ 10 times, and the peak pulse amplitude increased 2 - 2.5 times.

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- [2] Broudewie, Hitt, and Feldmon, J. Appl. Phys. 34, 3415 (1963).