Fizmatgiz, 1959.

1) r - rhombohedral phase (of the Sm type)

2) hd - hexagonal double phase (of the Ln type).

PRODUCTION OF GIANT LASER EMISSION PULSES IN NEODYMIUM ACTIVATED GLASS WITH THE AID OF TRANSLUCENT SOLUTIONS

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Submitted 1 March 1965

Giant laser-emission pulses can be obtained by Q-switching the optical cavity with the aid of mechanical or electro-optical devices.[1-3]

Variation of cavity Q in a ruby laser can also be effected with translucent substances. To this end, one places in the optical cavity a cuvette with a solution of phthalocyanine or cryptocyanine[4-6], which have absorption maxima near the 6943 Å line. To obtain an analogous effect with a neodymium laser, it is necessary to use translucent substances that absorb radiation in the region of 1.06 μ. We used the polymethine dye 1,9-di(N=ethylquinoline-4)-5-acetoxynonemethineperchlorate, which has an absorption maximum at 1.03 - 1.09 μ, depending on the solvent.

We used in the laser a rod of glass activated with neodymium, 120 mm long and 10 mm in diameter, and external dielectric mirrors with reflection coefficients 68 and 90%. In the free lasing mode, at a pump energy on the order of 2000 J, the output power was 4 J. The cuvette with a solution of the dye in quinoline (maximum absorption at 10.9 μ) was placed in the optical cavity.

Compared with the free lasing mode, Q-switching with the aid of a translucent solution makes possible the production of a smaller number of pulses (down to a single pulse), but of shorter duration and higher power. With increasing transparency of the solution, the number of emission pulses decreases. At a cuvette transparency 57%, the number of pulses was approximately 50, and a single pulse was observed at 36% transparency. The pulse duration also depends on the transparency of the solution, as can be seen from Figs. 1 and 2.

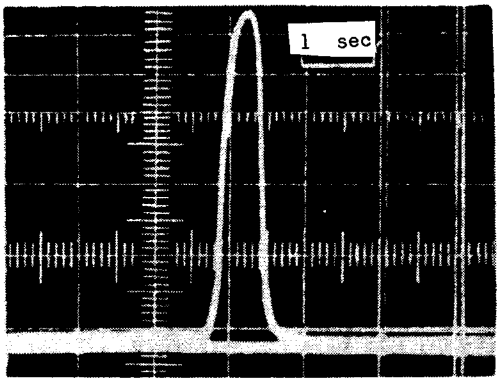

Figure 1
Oscillogram of one of the sequences of pulses at 75% cuvette transparency.

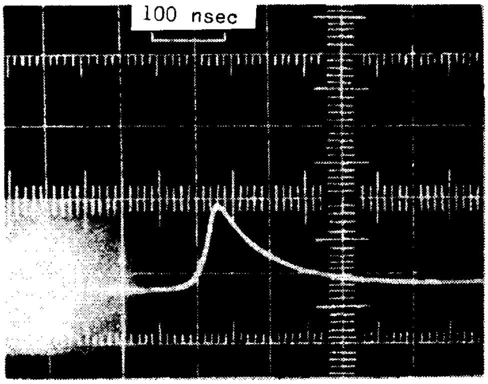

Figure 2
Oscillogram of single pulse at 36% cuvette transparency.

The character of the emission depends further on the pump energy and apparently also on the quality of the rod employed.

We take the opportunity to thank S. I. Borovitskii for a discussion of the results and for help with the work.

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CORRECTION

In the article by O. L. Lebedev et al. (JETP Letters v. 1, No. 2, Russian p. 16, translation p. 47, the following paragraph was omitted following Figs. 1 and 2:

In Fig. 2 the pulse duration reaches 80 nsec, and the corresponding pulse power is of the order of a megawatt. The amplitude of the oscillogram on Fig. 2 has been reduced by a factor 3×10^3 compared with Fig. 1 by using neutral filters placed ahead of the photomultiplier.