In connection with the observation of the $K_2^0 \to \pi^+\pi^-$ decay, L. B. Okun' [5] advanced a hypothesis whereby time parity may not be conserved in the amplitudes of all the processes in which strongly interacting particles participate. The expected contribution from the nonconservation of the time parity to the amplitudes of the different processes is then of the order of 10^{-3}. Thus, according to this hypothesis, the phase shifts η_1 and η_2 in formula (1), which are due to nonconservation of time parity, should be of the order of 10^{-3}.

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NEODYMIUM GLASS LASER WITH SINGLE PULSE DURATION CLOSE TO THE LIMIT

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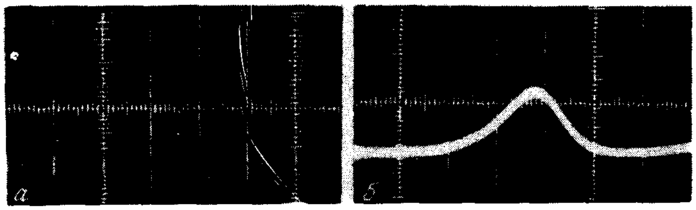
The role of various factors that determine the power and duration of a single pulse produced in Q-modulated lasers has been discussed in several papers. No account was taken in these papers, however, of the fact that when the duration of the pulse is on the order of several nanoseconds and the cavity is 30 cm or longer, the travel time of the radiation quantum between the cavity mirrors becomes commensurate with the pulse duration. It is obvious that the limiting duration of the single pulse is determined by the time required for the quantum to cover twice the distance between the cavity mirrors, this being necessary to effect feedback, i.e., for lasing to occur. At low values of the negative-absorption coefficient, the limiting duration of the single pulse is determined by more than two passages of the quantum between mirrors, the larger number being necessary to discard the excess particles from the metastable level. The pulse duration in neodymium-glass lasers with phototropic shutters amounts to 25 nsec according to [6] or 35 nsec according to our data [7], i.e., much longer than for ruby lasers, where it amounts to 9 nsec [3, 4].1)

We have therefore attempted to obtain a phototropic substance which would yield in the case of a neodymium laser a single pulse of near-limiting duration. After many attempts we found that one of the analogs of the pentacarbocyanins [6] makes it possible to obtain a single pulse of sufficiently small duration.

We used in the experiment a laser with neodymium glass of length 120 mm and diameter 12 mm and with an effective cavity length L_{eff} = 55 cm (the cavity is made up of two external mirrors with R_1 = 99 and R_2 = 40%). The transmission coefficient of the cuvette with the solution, located between the neodymium rod and the mirror with $R_1 = 99\%$, was ~ 20% for $\lambda = 1.06\ \mu$.

Under these conditions, we obtained a single pulse of duration ~ 10 nsec (Fig. 1a). At 3,000 J pump energy the pulse power was approximately 50 MW, and a spark was observed at the focus of a lens of f = 500 mm. With increasing effective length of the cavity, the duration increased nonlinearly, reaching ~ 330 nsec at L_{eff} = = 300 cm (Fig. 1b).



Output signal oscillograms for L_{eff} = 55 cm (a, time scale 20 nsec/cm) and 300 cm (b, time scale 250 nsec/cm).

It must be noted that at an effective cavity length L_{eff} = 55 cm, a pulse duration of ~ 10 nsec corresponds to the time necessary for the quantum to travel five times between the rotating mirrors. Inasmuch as in our case the threshold was exceeded relatively little, the single-pulse duration was practically close to the limit and was determined by the cavity and not by the shutter. At the same time, the results obtained indicate that the on-time of our shutter was lower than 10 nsec.

To obtain a single pulse of even shorter duration it is obviously necessary to reduce the effective length of the cavity and to increase the initial inverse population of the metastable level.

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CASIMIR OPERATORS FOR THE UNITARY GROUP

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A group-theoretical trend is now actively pursued in the theory of elementary particles, with the U(n) and SU(n) groups used most successfully to describe the symmetries of elementary