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ACTION OF THE LARGE DOSES OF GAMMA IRRADIATION
ON THE PROPERTIES OF LASER

by

U. A. Arifov, M. R. Bedilov, K. Khaydarv

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А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewhere.
When written as ё in Russian, transliterate as yё or ё.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	$\sinh^{-1}$
cos	cos	ch	cosh	arc ch	$\cosh^{-1}$
tg	tan	th	tanh	arc th	$\tanh^{-1}$
ctg	cot	cth	coth	arc cth	$\coth^{-1}$
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

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ACTION OF THE LARGE DOSES OF GAMMA IRRADIATION ON THE PROPERTIES OF LASER.

Academician AN of the Uzb.SSR U. A. Arifov, M. B. Bedilov, K. Khaydarv.

By us was investigated the action of γ-radiation on the properties of the stimulated radiation of four-level laser (lasers) on the glass, activated Nd^3 . Experimental installation and methods of recording the characteristics of the stimulated laser radiation are described in [1,2][1].

FOOTNOTE 1. In work [2] "dose 10^{14} rad" should be read "dose 10^8 rad" ENDFOOTNOTE.

Lasers (active element/cell together with resonators) we irradiated by γ-radiation Co^{60} with energy 1.17 MeV in the interval of doses $0-2 \cdot 10^8$ rad.

Time characteristics laser on the glass, activated Nd^{+3} depending on the degree of irradiance are given in Fig. 1 (a - generation to the irradiation; b, c - after irradiation by dose $2 \cdot 10^{8}$ rad respectively in 3 and 24 hours). The character of a change of the generation with time in dependence on radiation dose remains constant/invariable. Consequently, in the limits of the investigated doses the character of stimulated radiation is multimode and spike. Is experimental established that the general/common/total duration of stimulated radiation with an increase in the radiation dose is reduced. Before irradiation and in doses 10^{6}, 10^{8}, $2 \cdot 10^{8}$ rad the duration of stimulated radiation is equal to with respect 1000, 470, 370 and 90 μs about near-threshold electrical energy of excitation. This is connected with the fact that the threshold of the excitation lasers depends on the degree of the irradiance of active element/cell by the ionizing radiation/emission, since with an increase of radiation dosage stimulated radiation noticeably detains and attenuates earlier. For example, the threshold of the excitation of induced radiation before and after irradiation by doses 10^{8} and $2 \cdot 10^{8}$ rad composes with respect to 0.8; 1.3 and 2.9 kJ.

Under the action of γ-radiation in lasers substantially change the threshold energy of pumping, the energy of induced radiation and efficiency. Changes of the energy characteristics lasers in dependence on energy of pumping capacitor bank with different degree of irradiance laser are shown in Fig. 2. In character curved changes in the energy properties of the stimulated laser radiation in the range of radiation dose $0-2\cdot10^{8}$ rad it is possible to divide into two parts. In the first part ($0-10^{8}$ rad) with an increase in the radiation dosage increases the threshold of excitation, decrease by efficiency, energy and angle of the slope of curve (curve 3).

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Radiant energy laser before irradiation and in doses 10^{6}, 10^{8} rad composes 1.2; 0.6 and 0.3 J, with electrical energy of capacitor bank of 1.5 kJ the efficiency of laser radiation in the dose of 10^{8} rad 4 times it is lower than before irradiation (curve 1). In another segment of a curve ($2\cdot10^{8}$ rad) with an increase in the radiation dosage also increases the threshold of excitation, but increase the output of laser and the angle of the slope of curve (curve 4).

Findings show that when the laser is located directly under the action of the large doses of γ-radiation, the output of laser must be substantially more. Otherwise the more the time passes from the moment/torque of irradiation, the less the output of stimulated radiation. During experiment properties of resonator during irradiation lasers substantially they do not change.

We will also investigated restoring the generating properties lasers in dependence on the dose of γ-radiation. Which generate properties lasers it is possible the to restore/reduce, in particular, by annealing of color centers at room temperature (curves 5-10). It is established/installed, that restoring the properties lasers proceeds nonlinearly. With an increase in exposure time the threshold of excitation approaches according to exponential law the threshold of pre-irradiated state laser. The temporary/time dependence of the restoration/reduction of the threshold of the excitation lasers can be seen from Fig. 2. The annealing of lasers, irradiated by dose $2 \cdot 10^8$ rad at room temperature during 120 hours, decreases the threshold of excitation almost 2 times. Is characteristic the fact that restoring the energy dependency also depends substantially on radiation dose. In the limits of the dose of $0-10^8$ rad, it takes a normal course, i.e., with an increase in the time from the moment/torque of irradiation gradually it approaches an initial state (curve 2). When radiation dose increases to $2 \cdot 10^8$ rad, the restoration/reduction of properties laser occurs gradually.

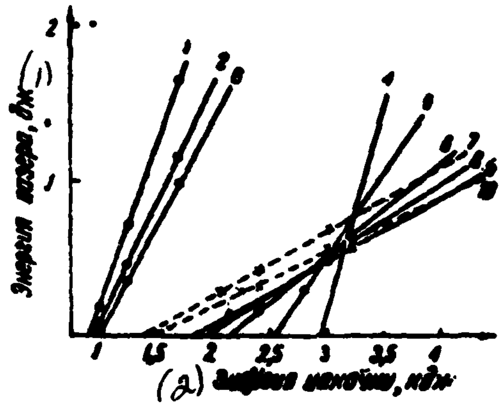

Fig. 1.

Fig. 2.

Key: (1). Energy of lase- J. (2). Energy of pumping, kJ.

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As can be seen from Fig. 2 (curves 4-9), first the output of laser decreases, and then (curves 7, 10) it begins to increase. is established/installed also the restoration/reduction of stimulated radiation of laser in the course of time (see Fig. 1c).

An increase in the output of laser in the large doses of γ-radiation can be explained, apparently, by the emergence of the new method of the energy exchange between color centers and by laser transitions, and also an increase of the absorptive power of active element/cell at useful laser energy levels.

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