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PULSED LASERS AND LASER APPLICATIONS

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ABSTRACTS

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energy at the wavelengths $\lambda_1 \approx 9.22$ micrometers and $\lambda_2 \approx 9.29$ micrometers, which are used for selective pumping of ammonia lasers [2]. The laser operated at pulse repetition rates of 10–50 Hz.

Investigations have shown that to produce radiation pulses in the form of only one peak, gas compositions of CO_2:N_2:He are required with a ratio of CO_2:N_2 = 4:1–6:1. The rejection of nitrogen in the mixture ensures the formation of radiation pulses with $\tau \leq 80$ ns, but leads to a decrease in the radiation energy in the pulse by more than an order of magnitude.

To obtain a spatially homogeneous volume pumping discharge in mixtures with a high content of carbon dioxide, a significant increase in the energy costs for pre ionization of gas mixtures was required. This problem was solved when switching to the formation of a volume discharge from two pulse generators – auxiliary and main – with independently adjustable parameters and an adjustable delay between the moments of starting the generators.

The maximum values of the radiation energy in a pulse of 1.5–1.7 J were obtained at wavelengths in the region of 9.4 and 10.6 micrometers. In a nonselective resonator under the same conditions of excitation and simultaneous generation at several wavelengths the radiation energy reached 1.8 J.

Currently, this version of the laser is used for the purpose of selective pumping of a laser on ammonia molecules in the pulse periodic mode.

1. *Anokhov S.P., Marusiy T.Ya. and Soskin M.S.* Tunable lasers. Moscow: Radio and Communications, 1982. 360 p.
2. *Vasil'ev B.I., Grasiuk A.Z., Dyad'kin A.P., Sukhanov A.N., and Yastrebkov A.B.* High power efficient optically pumped NH_3 laser, tunable over the range 770–890 cm^{-1} // Quant. Electron. 1980. V. 7, No. 1. P.116–122.

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CROSS SECTIONS OF EXCITATION TRANSFER IN COLLISIONS OF RARE EARTH METAL ATOMS IN UNSCREENED RESONANT 6*s*6*p* STATES WITH ATOMS IN THE GROUND STATE

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A method for estimating the cross sections of excitation transfer in collisions of rare earth metal (REM) atoms in the unscreened resonant states 6*s*6*p* with REM atoms in the ground state is proposed. The method is based on the fact that the upper levels acceptors of laser transitions in REM vapor lasers are populated in collisions with resonant levels-donors. The resonant levels are non-selectively populated by electron impact in gas discharge and spaced from the upper levels in energy by $|\Delta E| < k_B T$, where k_B is the Boltzmann constant and T is the gas temperature. The quantities required for calculating the cross sections are determined from the active laser medium parameters and average lasing power. The estimates of several partial and effective cross sections of excitation transfer in Dy–Dy and Tm–Er collisions are presented. The partial cross sections, depending on the excitation cross sections of the resonant levels, type of collisions and energy defect ΔE, are ~ 10^{-16}–10^{-14} cm^2, whereas the effective cross sections are ~ 10^{-17}–10^{-15} cm^2.

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COMPUTER MODELING OF XeCl LASERS

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Model of electro discharge XeCl lasers is developed. The computer model includes the following modules.