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KINETIC MODEL OF THE MANGANESE VAPOR ACTIVE MEDIUM

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Due to the high gain, the metal vapor active media are still used in technology. A feature of the manganese (or its halides) vapor active medium is the generation in both the visible and IR spectra. In the work [1], the possibility of realizing collisional competition in the manganese vapor active medium was shown, which can be used to transfer radiation from one spectrum to another. In [2], the lasing was obtained in the manganese chloride vapor active medium at a record pulse repetition frequency of 125 kHz.

To study the possibility of further increase of the pulse repetition frenquency, as well as transferring radiation from one spectrum to another, kinetic modeling is well suited. This report is devoted to the one-dimensional (radial) spatio temporal kinetic model of the manganese vapor active medium.

The kinetic model takes into account five laser transitions: 534.1, 542.0, 1.289, 1.329 and 1.332 nm. Also, the model includes the ground state MnI, the generalized level corresponding to the energy of 6 eV relative to the ground level, and the ground state of the ion Mn^+. The neon was considered as a buffer gas.

The model was tested on experimental data for a gas discharge tube with a discharge channel 30 long and 1 cm in diameter at pulse repetition frequencies equal to 17.6 and 100 kHz. The simulation results showed good agreement of the integral characteristics of the active medium with the experiment.

1. *Bokhan P.A., Burlakov V.D., Gerasimov V.A., and Solomonov V.I.* Stimulated emission mechanism and energy characteristics of manganese vapor laser // Sov. J. Quant. Electron. 1976. V. 6, No. 6. P. 672–675.
2. *Shiyanov D., Trigub M., Sokovikov V., and Evtushenko G.* $MnCl_2$ laser with pulse repetition frequency up to 125 kHz // Opt. Las. Techn. 2020. V. 129. 106302.