EXPERIMENTAL AND THEORETICAL STUDY OF GAIN TEMPORAL PROFILES IN ELECTRON-BEAM PUMPED HIGH-PRESSURE Ar-Xe AND He-Ne-Kr LASERS

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A series of dynamic parameter measurements of the high-pressure electron-beam-excited atomic Ar-Xe laser and the He-Ne-Kr laser has been made. Temporal profiles of the small-signal gain for 1.73, 2.03, 2.65, 3.37, 3.51 μm lines on the 5d-6p xenon atomic transitions with Ar-Xe mixtures and for 0.585, 0.703, 0.725 μm lines on the 3p-3s neon atomic transition with He-Ne-Kr mixtures was obtained for various values of the mixture pressure and the e-beam pump rate.

The experimental setup "Tandem" consist of two e-beam lasers with an active volume 10 liters and the maximal mixture pressure 3.5 atm each. The 350 keV e-beam current density inside the experimental laser chamber was approximately 1.7 A/cm² in 3.5 μs pulse. The source of the input probe beam was the e-beam Ar-Xe or He-Ne-Kr laser with hot cathode and a 30 μs e-beam pulse. Typical experimental amplitude small-signal gains lie in the range 0.25 - 0.1 cm⁻¹ for the Ar-Xe laser and near 0.02 cm⁻¹ for the He-Ne-Kr laser.

Based on the result of gain measurements and the conceptions of performances of these lasers [1,2], authors report on computer models of the e-beam Ar-Xe laser and the He-Ne-Kr laser well described generation and gain parameters of this lasers. The author hypothesis that dissociative recombination of heterodimer ArXe^+ directly populates upper laser levels (5d manifold) of xenon and conventional constants of plasma chemical processes in the Ar-Xe laser allows to compute close to experimental laser output, laser spectral composition and efficiency parameters. Also experimental unknown rate constants of the heavy-particle quenching low laser levels (6p manifold) by argon were defined.

1. N.G.Basov et al.-IEEE J.Quant. Electron., **QE-21**,1756 (1985).
2. N.G.Basov et al.-Sov. J. Quant. Electron., **15**, 1004 (1985).