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N. Sazhina, N. Ustinovsky, I.V Kholin, A. Chugunov. PUMP-DEPENDENT SPECTRAL DISTRIBUTION AND TIME BEHAVIOUR MEASUREMENTS IN HIGH POWER Ar-Xe LASER UNDER E-BEAM AND E-BEAM SUSTAINED DISCHARGE PUMPING. Journal de Physique IV Proceedings, 1991, 01 (C7), pp.C7-590-C7-590. 10.1051/jp4:19917157 . jpa-00250833

HAL Id: jpa-00250833

<https://hal.science/jpa-00250833>

Submitted on 1 Jan 1991

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PUMP-DEPENDENT SPECTRAL DISTRIBUTION AND TIME BEHAVIOUR MEASUREMENTS IN HIGH POWER Ar-Xe LASER UNDER E-BEAM AND E-BEAM SUSTAINED DISCHARGE PUMPING

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The high pressure Ar-Xe laser on XeI transitions of the 5d-6p manifold is attractive because of its high efficiency ~5 %, high specific energy ~8 J/l and wavelength ranging from 1.73 to 3.51 μm . The purpose of our study is to investigate spectral distribution and time behaviour of Ar-Xe laser radiation under electron-beam (E-beam) and E-beam sustained discharge (EBSD) pumping with E-beam current density j being varied in $j=0.01\div1.7 \text{ A/cm}^2$ range. Total pressure p and Xe fraction δ varied in $p=1\div3.5 \text{ atm}$, $\delta=10^{-1}\div10^{-4}$ ranges. We used unstable telescopic resonator with $M=2$, active volume being 7.5 l. In the case of E-beam pumping of the optimal mixture with $p=3.5 \text{ atm}$, $\delta=10^{-2}$ and high current density $j=1.7 \text{ A/cm}^2$, the main part of the laser energy is concentrated in two lines with $\lambda=1.73 \mu\text{m}$ (90%) and $\lambda=2.63 \mu\text{m}$ (10%). The decreasing of j up to 0.04 A/cm^2 is followed by the laser energy redistribution from $1.73 \mu\text{m}$ ($2.63 \mu\text{m}$) line to $2.65 \mu\text{m}$ ($3.37 \mu\text{m}$). Further decreasing of j up to 0.01 A/cm^2 leads to replacement of the line $\lambda=2.65 \mu\text{m}$ by the line $\lambda=3.37 \mu\text{m}$ (90%). For the whole set of experimental conditions the following is true: despite the initial spectral distribution for all j values, EBSD pumping leads to spectral distribution similar to the case of high current E-beam pumping with $j=1.7 \text{ A/cm}^2$. We may conclude that for both cases the spectral distribution depends only on the pump power. It is not occasional coincidence and finds its explanations in terms of discussed Ar-Xe laser recombination model.