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XECL-LASER SPECTRUM DYNAMICS.

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It is well known that the XeCl laser spectrum consists of four bands which are attributed with the B-X (0-0, 0-1, 0-2 and 0-3) transitions of XeCl molecules. Two of them (0-1 and 0-2) are commonly stronger and other two (0-0 and 0-3) are weaker. We have found that this structure of spectrum can be substantially modified by changing the XeCl laser pumping conditions. In particular, we have obtained the XeCl laser spectrum with almost equal intensities of the all bands. In addition, we have formed a mathematical model for XeCl laser output spectrum formation which enables us to predict the optimal conditions for laser action on different transitions of XeCl molecules. This paper presents both our experimental and theoretical results. According to our experiments, the best conditions for weak laser bands formation are as follows: i pumping power density must exceed 1 MW per cubic centimeter ii Xe: HCl density ratio must be about 30-50: 1 (that is higher than in commonly used gas mixtures) iii total gas pressure in Ne diluted mixtures must be as high as possible In our opinion, these results can be explained by the substantial difference between saturation intensities of all four laser transitions. Based on our theoretical simulation we can describe the output spectrum formation in such a way. The small signal gain is higher on 0-2 transition at the very beginning of laser pulse. But in the first 5-10 ns the population of the level X(2) increases rapidly resulting in the fall of the gain on this transition below the value of the gain on 0-1 transition. After about 20 ns the gain on 0-0 transition dominates. Since this time the intensity on 03 transition also increases faster than the intensity on the strong transitions. Therefore, if the laser pulse is substantially long the intensities of different bands in the output spectrum can be very close. The spectrum also depends strongly on the dissociation rate of the lower laser levels in comparison with the collisional mixturing rate of these levels. In summary, there is a possibility to widen the XeCl laser spectrum and therefore to increase its tunability.