

z핀치 방전을 이용한 수소형 탄소 18.2nm 레이저 개발 연구
Possibility of C VI 18.2nm soft x-ray laser using a z-pinch
discharge

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Recently, there has been a big progress in the x-ray laser experiment using capillary discharge system. Shin *et al.* [1] and Rocca *et al.* [2] obtained gains on H-like C VI 18.2nm using a wall-ablated capillary discharge and Ne-like Ar IX 46.9nm using a gas-puff capillary discharge, respectively.

As an extension, the gain characteristics of a gas-puff capillary discharged carbon plasma is investigated using 1-D Lagrangian MHD code [3]. This code solves single-fluid and two-temperature MHD equations along with an ionization balance equation under the assumption of axial symmetry and using a vacuum-plasma interface boundary condition. This code includes convective heating, heat conduction, artificial shock heating, radiative loss of resonance lines, heat transfer by ionization and recombination and electron-ion heat equilibration.

The calculation was carried out for different initial density N_0 and peak plasma current I_0 with initial radius $R=2\text{mm}$ and current pulse period, $T/4=100\text{ns}$. The calculation shows that there exists an optimum gain condition, $I_0=110\text{kA}$ and $N_0=2.5 \times 10^{18}\text{cm}^{-3}$ and with the gain value of about 20cm^{-1} in the optically thin case.

The detailed dynamics of the plasma with optimum gain, temporal evolutions of plasma quantities will be presented.

참고문헌

1. H. J. Shin, D. E. Kim and T. N. Lee, Phys. Rev. E, 50, 1376(1994).
2. J. J. Rocca, V. Shlyaptsev, F. G. Tomaselli, O. D. Contarini, D. Hartshorn and J. L. A. Chilla, Phys. Rev. Lett., vol.3, 2192 (1994).