LASER FOCUSING AND MULTIPLE IONIZATION OF ARGON IN A HYDROGEN PLASMA CHANNEL CREATED BY A PRE-PULSE

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A model for plasma channel formation by a laser pre-pulse in a low Z gas (Hydrogen) embedded with high Z atoms (Argon) is developed. The laser of intensity $I \cong 10^{14}\, W/cm^2$ ionizes hydrogen atoms fully whereas Argon atoms are ionized only singly. After the first pulse is gone, plasma expands on the time scale of a nanosecond to produce a hydrogen plasma channel [1,2] with minimum density on the axis. A second intense short pulse laser of intensity $I \geq 10^{16}\, W/cm^2$ gets focused. It tunnel ionizes the remaining Argon. The Argon acquires Ar^{8+} charge state after loosing 8 ions and acquires Neon like configuration and could emit X-rays[3,4].

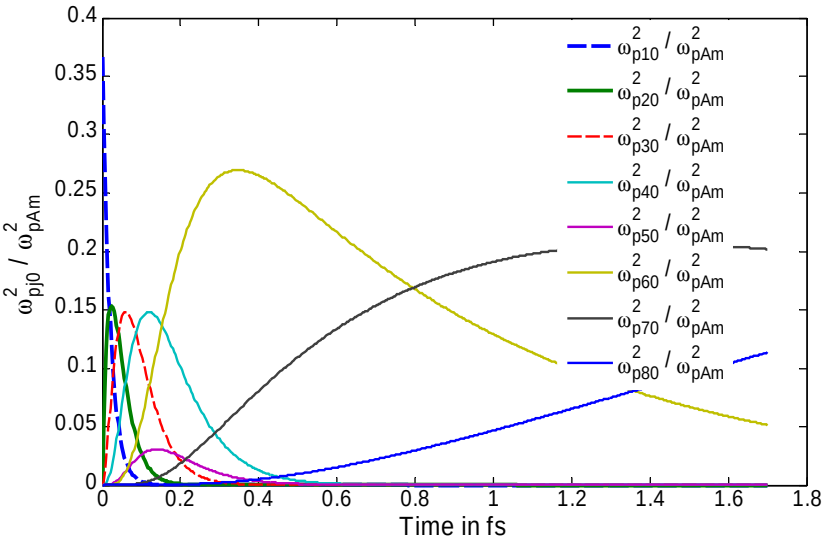

Figure 1. Variation of axial density of different charge states of argon ions with time. For parameters $a_0 = 0.2$, $I_H / I_A = 0.8630$, $\omega^2_{pmH} / \omega^2 = 0.05$ and $\omega^2_{pmA} / \omega^2 = 0.005$.

References

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