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**Precursor ionization ahead of laser-supported detonation wave in air and argon** KOHEI SHIMAMURA, KIMIYA KOMURASAKI, Graduated School of Frontier Sciences, University of Tokyo, HIROYUKI KOIZUMI, Research Center for Advanced Science and Technology, the University of Tokyo, YOSHIHIRO ARAKAWA, Graduated School of Engineering, the University of Tokyo — Laser-produced plasma in a gaseous form is considered, which has attracted great interest for use in many devices. After breakdown one of possible mechanisms of occurrence of this process is noted as laser-supported detonation wave. This wave consisting of the shock wave and the beam absorbing plasma travels at several kilometers per second along the laser beam channel in the direction opposite to the beam incidence. A Nd: Glass laser and a TEA $CO_2$ laser were utilized. According to shadowgraph and spectroscopic studies, the wave has a velocity of 1-10 km/s, an electron temperature of 2-5 eV and an electron density of $10^{24}$ $m^{-3}$ after breakdown. For simplicity, the discussion is restricted to one-dimensional flows that considers the radiation from plasma and the collisional ionization by laser irradiation. Assuming that UV photons radiating from laser plasma induce photoionization ahead of ionization front, this ionization frequency $f_p$ at the distance $l_p$ (mean free path of photon) from the wave front corresponds to $10^{10}$ $s^{-1}$. This is higher than the collisional ionization frequency ($10^{5-6}$ $s^{-1}$). Analytical velocities ($f_p l_p$) describing the avalanche ionization in the pre-ionization layer agree with the experimentally observed velocities. These results does not depend on background gas and laser-wavelength.

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