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**Double core-hole emissivity of transient aluminum plasmas produced in the interaction with ultra-intense x-ray laser pulse** CHENG GAO, JIAOLONG ZENG, JIANMIN YUAN, National University of Defense Technology — Emissivity of single core-hole (SCH) and double core-hole (DCH) states of aluminum plasmas produced in the interaction with ultra-intense x-ray laser pulse interaction are investigated systematically by solving the time-dependent rate equation implemented in the detailed level accounting approximation. We first demonstrated the plasma density effects on level populations and charge state distribution. Compared with recent experiments, it is shown that the plasma density effects play important roles in the evolution dynamics. Then we systematically investigated the emissivity of the transient aluminum plasmas produced by the x-ray laser pulses with a few photon energies above the threshold photon energy to create DCH states. For the laser photon energy where there are resonant absorptions (RA), 1s-np transitions with both full 1s and SCH 1s states play important roles in time evolution of the population and DCH emission spectroscopy. The significant RA effects are illustrated in detail for x-ray pulses, which creates the 1s-2p resonant absorption from the SCH states of Al VII. With the increase of the photon energy, the emissions from lower charge states become larger.

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