X-ray spectroscopy diagnostic of iron plasma formed in experiments with ultra-relativistic femtosecond laser pulses in the case of pre-plasma formation control

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In this work, we present the results of x-ray spectroscopy diagnostics in an experiment with a J-KAREN-P laser facility for deliberate pre-plasma formation in steel foils, when a time-controlled femtosecond laser pulse was used for pre-plasma generation. The comparison of observed spectra of F-like and Ne-like Fe ions with results of kinetic modeling allowed to measure main parameters of plasma corona. We observed that plasma parameters mostly depend on natural sub-nanosecond laser pre-pulse, but fs-prepulse variation at the few-hundred picosecond timing becomes insignificant.