Optimization of the Xe laser-plasma EUV source with an intensive UV preionization

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To enhance emittance of the LPP EUV source with Xe gas jet target, the main infrared Nd:YAG laser pulse was proposed to be preceded with that of an ultraviolet KrF excimer laser. First experiments on realization of that proposal are described in the present paper. The studies were performed at target densities of $10^{17}$-$10^{18}$ cm$^{-3}$, in order of magnitude. Photography of laser spark forms in the visible range and with a long exposition and measurements of the EUV in-band plasma radiation intensity with the aid of surface-barrier Si photodiodes were used as diagnostic tools.

Typically, the UV prepulse application resulted in an increase of the short-wave radiation output, with its value depending on a delay of the main pulse relative to the prepulse and on focal point locations one relative to another. The most surprising fact was very long times of persisting the prepulse impact on the target medium: under some experimental conditions the maximum increase of the EUV output (up to 2-2.5 times) was obtained at the delays close to 1-2 microseconds. Possible mechanisms to explain this phenomenon are discussed.

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