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Reflectivity and spectral shift from plasma mirrors generated by KrF laser

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It was recently shown [1] that plasma mirror can be an applicable pulse cleaning method even for UV lasers, as up to 70~\% efficiency can be obtained for intensities of 10^{15}~W/cm^2. High acceleration of KrF laser produced plasmas was also observed [2]. Even recent results show that absorption and reflection of intense ultrashort laser pulses from laser plasmas depend strongly on the temporal contrast of the laser beam [3]. In our lab a new non-linear Fourier-filter method [4] was demonstrated for the contrast improvement of short-pulse KrF lasers and this was applied the first time here for high-intensity laser plasma experiments. It was found that increasing the intensity of the 248~nm, 600~fs laser pulse from 10^{15}~W/cm^2 to 10^{18}~W/cm^2 the plasma reflectivity not only saturates but decreases below 20~\% for different target materials and different polarizations. The spectral shift of the reflected beam depends strongly on the contrast of the beam. Using the improved contrast of $5 \cdot 10^{11}$ with the Fourier filtering spectral blue shift up to 0.6~nm was observed, corresponding to the plasma acceleration of $4 \cdot 10^{18}$~ms^{-2}. This is approximately four times higher than the previous result [2] and it does not depend strongly on the incoming beam polarization. Thus the acceleration is probably caused by the ponderomotive force.

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\noindent\textbf{References}
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