The short wavelength, high beam quality and the available >7% plug-in efficiency of KrF excimer lasers make them alternative candidates as IFE driver. Their short wavelength may be advantageous for fast ignitors as well, due to their longer penetration depth into the plasma. It was recently shown [1,2] that the same amplifiers can be used for the fast ignition as the compressing ones with ~30 % increase of the pumping time of the e-beam pumped amplifiers.

For fast ignition with KrF lasers amplifiers of some picosecond duration focussed to 10^{20} \text{ W/cm}^2 intensity in several beams is needed for electron acceleration up to 2\text{MeV}.

In our laboratory (HILL) experiments are carried out using a modest, discharge-pumped short-pulse KrF system of 600 fs pulse duration. Due to the saturation regime of the amplifier and the long discharge duration compared with the recovery time polarization multiplexing schemes are investigated to obtain sufficient energy from a single amplifier.

For the fast ignition scheme the prepulses and thus preplasmas of the short laser pulse must be avoided. We obtained ~50% reflectivity using the plasma mirror effect [3] which allows its use in the beam even after full amplification. Different geometrical schemes are investigated with this amplitude modulation method of the plasma mirror. An alternative might be phase modulation using the properties of refractive index changes in a gas jet due to plasma formation in it.

References