

Investigation of the dynamics of plasma channels in fused silica formed by tightly focused Cr:Forsterite femtosecond laser radiation

diploma thesis by the six-year student

Potemkin Fedor Viktorovitch

ABSTRACT

Dynamics of plasma channel formed by Cr:Forsterite femtosecond laser radiation tightly focused into the volume of fused silica was investigated in the degree research. The fundamental radiation with $\lambda = 1.24 \mu\text{m}$ and second harmonic radiation with $\lambda = 0.62 \mu\text{m}$ of Cr:Forsterite laser system was tightly focused by lens with numerical aperture $\text{NA}=0.4$ into the volume of fused silica. The plasma channel formation dynamics analysis was carried out using pump-probe method. The fundamental Cr:Forsterite laser radiation produced the electron-hole plasma in the volume of fused silica; the second harmonic Cr:Forsterite laser radiation delayed relative to fundamental laser radiation was absorbed by plasma electrons. Increasing probe pulse energy absorption up to 30% was observed at time delay up to $\tau \cong 210 \pm 70$ fs. The decrease of probe pulse energy was due to probe pulse energy absorption by electrons of plasma produced by pump Cr:Forsterite laser radiation pulse. At picosecond time scale fused silica transmittance reached the value of 85%. Such behaviour can be explained by probe pulse scattering on destroying matter of fused silica (micromodification formation).

Scientific adviser,
associate professor,
candidate of physical and mathematical science

//Mikheev P.M.